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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

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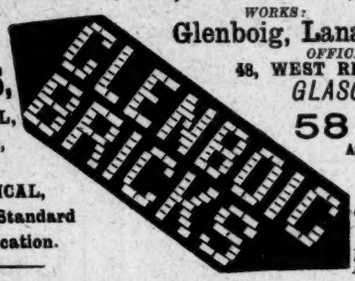

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VOL. CLVIII., No. 3074.] WEDNESDAY, APRIL 12, 1922. [74TH YEAR.

EDITORIAL NOTES.

Thermal Efficiencies.—Importance of Utilizing Suitable Appliances.

THE members of the North British Association of Gas Managers had under consideration last Friday the question of thermal efficiencies. The subject was introduced in papers contributed by Mr. George Keillor, of Greenock, and Mr. J. Richmond, of Penicuik. The paper by Mr. Keillor is one of outstanding interest, because of the plain expressions of opinion and the perspicacity it contains, reinforced by the results of investigation. In the first place, we are glad to see the author's acknowledgment of the intrinsic value of the Gas Regulation Act to the economic position and progress of the gas industry. No longer, he says, is the road to progress and higher efficiencies barred by effete legislation. Never before have the industry and its professional men been endowed with so much scope and opportunities for invention and expansion. But, as we have said before, and the emphasis of repetition appears to be necessary, the whole meaning and importance of the Act to the industry seems to be little understood in some managerial quarters, and therefore little appreciated. There is one very important condition precedent to the industry realizing the fullest practicable harvest from the potential powers of the Act. It is that the Act must have application to every gas undertaking in Great Britain; but, through inappreciation, there are still many undertakings that have not yet made application for Orders under section 1. Local authorities are especially noticeable for their slackness in this connection; but we are rapidly moving towards the time when the Act decrees that what is not done voluntarily may be enforced by the Board of Trade, so as to bring the whole of the statutory elements of the industry into one line. Though there is at present no compulsion upon them, non-statutory undertakings can get into the same line by Special Orders. We have used the words "practicable harvest," because the full harvest made possible by the Act will never be reaped so long as there is any latent capacity in the industry for further progress in economy and efficiency; and there are no available means of measuring that latent capacity.

There is one thing insistent, which some low-grade gas enthusiasts would fain have people overlook. It is that the first stage in taking advantage of the Act is to utilize to the best advantage existing conditions in the making of therms. One cannot now determine what will be the ultimate stage in therm production; and therefore it would be ridiculous to attempt to pass by one stride from the present to that stage. The great war and coal strike periods have furnished many lessons for the technical men of the gas industry—among them their ability to supply, and the consumers' ability to utilize, a much lower calorific value of gas than was supplied in pre-war times. This is valuable experience; it has proved the latitude in power and strength that the industry possesses. But what does the Act provide?—Not necessarily the lowest calorific value gas that can be made and utilized under existing conditions, but the calorific value gas that can be most economically made by each undertaking in the circumstances of any time. Just as circumstances vary with each undertaking, so circumstances vary from time to time. When there were short supplies of coal, when it was worse in quality and the price higher than to-day, when oil was at a prohibitive price for gas making, then it was politic to get all the gas one could out of the conditions; but in every one of the respects named, circumstances have now altered. And, as Mr. Keillor indicates, what has to be done is to determine the net costs of production of any calorific grade of gas in existing circumstances. If this is not done from time to time, then part of the liberty that the Regulation Act confers is sacrificed. Therefore, cost of production is one determining factor in deciding upon the calorific value to declare; the other factor is the ability of existing appliances to give maximum efficiency whatever the calorific value declared. It is surprising, given the means of close adjustment, what a large power exists in gas-burners to deal with calorific values varying very widely per cubic foot.

Mr. Keillor's experience has given him a strong inclination towards what we term (in these days) low-grade gas; our successors may look upon the same values as high-grade ones. We get an inkling of his view quite early in the paper, when he says that deficiencies in the distribution system should not be allowed to stand in the way of a cheap, abundant, and efficient gas supply, if such can be provided, at calorific values below 450 B.Th.U. In his opinion, too, the time has long since passed for debating the relativity of high and low calorific power gas. One trouble in this respect is that there is such a big divergence of view as to what is "high" and what is "low" calorific value gas. Furthermore, the time is past for postulation; and Mr. Keillor boldly challenges the advocates of high calorific power gas in Scotland to show that the 400 B.Th.U. quality, selling at 1s. per therm, has not more value in it as an article of everyday use than a 550 B.Th.U. gas also selling at 1s. per therm. Mr. Keillor himself supplies 410 B.Th.U. gas, so that he speaks not on mere opinion, but from experience. In his view, in Scotland, where vertical retorts exist, a calorific value of between 400 and 450 B.Th.U. will be declared—a favourite figure being 425 B.Th.U. While he advises caution at the present time in regard to manufacturing methods, looking forward he will not be surprised if, with the exercise of inventive faculties, in a few years' time we are making 30,000 to 40,000 c.ft. of 420 B.Th.U. gas, or between 126 and 168 therms, per ton of coal.

An interesting table is given, showing the differences in volume of gas obtained when produced at various calorific values, and with a demand on the carbonizing plant for 8000 therms per day. The table ranges from 400 to 600 B.Th.U. gas. The variation in the quantity of coal required according to make per ton and calorific power is notable, as also are the differences in the yield of therms. The difference in the number of cubic feet which are the equivalent of a therm at the various calorific powers per cubic foot is not great, though, until the figures are actually calculated, some people jump to the conclusion that the quantity would be larger. While 200 c.ft. of 500 B.Th.U. equal a therm, 250 c.ft. of 400 B.Th.U. equal a therm—only 50 c.ft. more. But there are few operations in which a therm is applied all at once. If we take a small gas-fire requiring 10,000 B.Th.U. per hour, the difference in the volume of gas required would only be 5 c.ft. spread over an hour. Another point in this connection that should not be overlooked—though it often is—is the fact that the volume of air needed for complete combustion in the mixture with the lower calorific power gas is smaller than in the case of higher calorific power gas.

As has been already said, Mr. Keillor supplies at Greenock a gas of 410 B.Th.U. gross; and he has no difficulty in keeping within 2½ p.ct. either way—up or down. This is not a temporary experience; it has been going on for some few years. The period gives more weight and value to the views of our Greenock friend. The gas is distributed through 70 miles of mains, and is used for all sorts of purposes. There are fewer troubles than formerly. "Once you "have overtaken the readjustment of appliances, and are "able to maintain a pressure of 2 in. at the meter-inlet,

"nothing better is required." Supervision is also given beyond the meter, though not under legal obligation. This is the secret of success. Such experience goes a long way in helping forward the cause of promoting higher efficiencies. Satisfaction of consumers must be the dominating factor in any determination of calorific value and manufacturing practice; and, therefore, the personal experience, combined with the large part of the paper that deals with thermal efficiencies in utilization, will be studiously considered by all readers. Mr. Keillor deals with lighting, cooker, and boiling ring efficiencies. Several engineers have been heard to express doubts as to whether (say) in lighting a low-grade gas can give a better efficiency than a high-grade one. As a matter of fact, if the high-grade gas does not exceed 550 B.Th.U., there is not a great deal of difference in the efficiency, provided the conditions of use are the most suitable to the promotion of high efficiency. This is in favour of low-grade gas if its production means an economy and a lower selling price over high-grade gas in like circumstances. However, it is submitted in the paper that a low B.Th.U. gas containing about 15 p.ct. of carbon monoxide gives a more brilliant illumination than a high B.Th.U. gas. But here we get an illustration of the importance of the conditions of utilization. At Greenock, there has been considerable success in advising consumers to re-nozzle burners, and use medium size mantles, which are better filled with flame when burning a low calorific value gas. In a reference to the performance of a cluster of three bijou mantles in a setting no larger than an ordinary inverted burner, another lighting illustration is obtained as to the part that conditions of use play in efficiency. The cluster consumes per hour 5 c.ft. of 400 B.Th.U. gas at 2-in. pressure, as compared with 4·53 c.ft. of 563 B.Th.U. gas in a universal inverted mantle. The illuminating effect was to the advantage of the low calorific value gas; but with it 2000 B.Th.U. per hour were required, while 2551 B.Th.U. were needed with the high B.Th.U. gas. Therefore, the user buying gas on the thermal basis will, in the circumstances, find the lower B.Th.U. gas the more economical.

Coming to cooking, Mr. Keillor gives tables showing experimental data with different grades of gas used in different types of cookers and boiling-rings. We suggest that the figures prove more than anything else the value to the consumers of new types of appliances in the promotion of efficiency. Anyone who studies the tables will see that the best efficiencies were obtained with gas between 402 and 421 B.Th.U.; and the lowest efficiencies with high-grade gas. But what else do we find? That, with one exception, all the low B.Th.U. gas tests were made with a new type of cooker (with open sectional top bars) and with two new types of boiling-rings; but (with the one exception of a boiling-ring test) all the tests of high-grade gas were made on old type cookers and with old type bars. This is not altogether comparative; and we hope that Mr. Keillor will supplement his experiments, for very good grounds are shown in the tables for doing so. For example, there is no great difference between the efficiencies with low and high grade gas used with the old-type cookers; but there is a considerable efficiency difference between (and in favour of) low-grade gas used with new type cookers and high-grade gas used with old type cookers. There is one test with ring burner "B," using 563 B.Th.U. gas, which gives an efficiency of 63·56 p.ct.; but with this same boiling-ring, using gas of between 402 and 421 B.Th.U., the efficiencies in six tests show only one slightly higher, 63·71 p.ct.—the others all being lower. The tests, however, do prove that the consumer can get, with equal conditions of use (and he will be wise if he has modernized types of appliances), as good efficiencies with low-grade gas as with high-grade. Therefore if the low-grade gas can be purchased at a cheaper rate per therm, the consumer will reap advantage.

On the strength of his experience and investigations, Mr. Keillor urges gas engineers to march with the times. His paper is one that will give proper direction to thought over a matter that has such immense importance in the present and future policy of the industry.

Another View.

THE paper by Mr. Richmond, as presented to the meeting, is not nearly so satisfactory a composition as that of Mr. Keillor. The author acknowledges that his case is rather general in character, and not based on any exact investigation. Nevertheless, he is of opinion that those who advocate the supply of gas of 400 to 450 B.Th.U. have founded their faith on wrong premises; and that in the long run any economies effected by manufacturing low-grade gas are more than off-set by increased expenditure in other directions. In his judgment, 500 B.Th.U. gas will be found the best. This will depend at any time on the then circumstances—plant conditions and market prices for raw materials—such as were referred to in our first editorial last week. Later on he submits that it would be better to produce per ton of coal 10,000 c.ft. of good gas, with 10 cwt. of coke for sale, than it would be to produce 20,000 c.ft. of inferior quality gas with only 5 cwt. of coke. Mr. Richmond does not compare receipts. He relies on the cost of coal after deducting only coke—allowing the 20,000 c.ft. make to have 5 cwt. of coke for disposal. There is, however, no rational comparison between the 10,000 c.ft. and the 20,000 c.ft. of gas. The calorific power per cubic foot is not the same. Supposing the 10,000 c.ft. represent 55 therms, and the 20,000 c.ft. 80 therms. There are very few horizontal retort works that show a yield of 64 to 70 therms. What do we find? That the former at 1s. per therm would produce £2 15s., while the latter would yield £4. If a ton of coal costs 25s., less ½ ton of coke selling also at 25s. per ton, the cost of the ton of coal (without deducting the receipts for any other secondary products) would be 12s. 6d.; while if there is only ¼ ton of coke for sale, this would produce 6s. 3d., which on this basis would make the cost of the coal 18s. 9d.—the difference being 6s. 3d. on the cost of the coal. But the therms would sell for 25s. more. Which, therefore, is the better proposition, and which would give better facility for reducing the price per therm?

Then, again, on Mr. Richmond's coalless-coke figures, he shows a difference in favour of the 20,000 c.ft. cost of £15 11s. 6d. per million c.ft., about which sum he does not appear to think over-much, although the saving is equivalent to 3·728d. per 1000 c.ft. This 3¾d. strikes us as well worth having, even though there may be some deductions to be made from it. Beyond it, as we have shown, at parity of selling price per therm from the two gas-producing processes, there would be the additional revenue from the sale of the extra therms. Mr. Richmond is also afraid that economies in carbonizing may be more than negatived by increased costs in other directions due to excess sulphur compounds and carbon dioxide. It depends entirely upon how the low-grade gas is produced; and the quality of the material from which it is made. One cannot possibly condemn low-grade gas because a certain thing happens with one particular form of process or coal, and does not do so with another. Then there is the wear and tear of plant, which Mr. Richmond thinks will increase with years if the lower quality gas is continued. There, again, it depends upon how the lower-grade gas is made that gives the greater number of therms for sale. Some engineers are actually working their retort plant at a lower temperature, and producing gas which will carry a larger percentage of water gas—blue or slightly carburetted. The capital, wear and tear, and labour costs are low with water gas on the basis of per 1000 c.ft. or per therm, as compared with retort-house plant. Admittedly, renewal costs to-day are of a different order from those that formerly ruled, and naturally everything that can be done should be done to increase the life of plant; but every phase of this subject must be governed by economic considerations. We quite admit the corrosive influences of some forms of gas sent out to-day; but this is now being corrected by a larger use of oil in manufacture. At the price ruling for oil, this is not on the therm basis of gas selling a bad investment; and the protective effects are something additional. Then from the consumers' point of view, if Mr. Richmond will study the matter from the therm basis, instead of from that of cubic feet, we venture to think he will see things in a somewhat different light.

Electric Shocks in the Lords.

THE supporters of the Electricity Supply Bill (the chief intention of which is to fill-up the financial gaps in the original 1919 Act, which brought the Electricity Commissioners into being, and is designed to regenerate electricity production in this country) had some ugly shocks in the House of Lords last week. It will be remembered that the Bill had second reading in the House a short time ago; but the majority was then so slender that the Government thought it well to defer proceeding with the measure until they had indulged

in some attempt at pacification of the hostile ones. There appears to have been a degree of success by compromise, but insufficient to stem active opposition. This was soon apparent on the re-introduction of the Bill for the Committee stage. The Government have not been able to hide the facts that they appreciate the measure is on an unsafe foundation, and that there is good intellectual opinion in opposition, while support for it is largely political and partizan in nature. The Marquis of Salisbury suggested the Bill should be referred to a Select Committee, on the ground that the questions should be investigated as to the extent the matters dealt with by the Bill should be under bureaucratic control, and the degree to which the rates should be used for the purposes indicated in the Bill. These are quite legitimate matters for investigation in respect of proposed legislation of a permanent character. It was, however, quite clear that the Government were afraid to allow the measure to get in any way out of their immediate control, and so would not accept the proposal, which was put into formal order by the Earl of Bessborough moving that it should be so referred. The motion, however, was rejected; but even in this the Government had a nasty jar. The rejection was only carried by two votes—42 to 40!

This must be a good indication to the Government that this new electrical legislation is as much unwanted as it is said to be wanted, and only wanted by whom?—Visionaries and a few politicians who know precious little about the matter. It is highly amusing and not a little amazing to many experts to find Viscount Haldane professing such omniscience that he could tell the House that these electrical schemes do not involve the putting of extra money burdens upon the ratepayers, but actually mean the saving of money for them. There are many experts who wish they could think and believe the same, in view of the headstrong Government attitude in the matter. Here was Viscount Haldane harping upon that old error (which he accepts as truth) that the schemes are going to save 55 million tons of coal a year. He talks of it as though, if the Bill goes through, a 55 million ton saving will be an assured and quickly an accomplished thing—a real material saving to the country. Only fools agree with that, or men who have not the capacity or means of testing the possibility of materializing the assumption. Viscount Peel, another supporter of the Government in this matter, was equally as bold in his assertions. A great object of the Bill, he said, is to provide cheap electricity, to get factories going, and so to relieve unemployment. One can hardly imagine Viscount Peel making himself so ridiculous, but he succeeded admirably. He illustrated once more the great divergence there is between political assumption as to, and practical recognition of, what is possible; and it is what is reasonably possible that matters. Practical men know that it will take years to carry-out the schemes; practical men know that the chance is very remote of the saving in coal effecting such a reduction of outlay that electricity will be cheapened so much as to make a tangible difference to electrical energy charges in the industrial areas, where they are already low; and practical men know that, if cheaper electrical energy is the only means of relieving unemployment, then the army of unemployed will be sitting on the doorstep of electrical adventure for a very long time to come. There is a great difference between specious argument and practical possibility. To the former the House of Lords were treated lavishly. The electricity industry will not be proud of the character of the progress of the Bill, nor of the means by which it is trying to make headway, with the Government and crass ignorance pushing it along from behind.

However, there was one gratifying feature in last week's proceedings on the Bill. It was the evidence of a desire to give ratepayers better protection than they would have possessed if the Bill had passed as originally drafted. One cannot measure the degree of generosity some local authorities might show in lending money to the joint electricity authorities, or in guaranteeing interest on money spent on something the administrative and remunerative future of which is totally unknown. The fact that there has to be this resort to the assistance of external authorities as an appendix to the ordinary methods of direct financing is good evidence of the recognition by the Government of the want of internal strength in the joint electricity authorities. A power company would have to finance itself. Joint electricity authorities, according to the Government and the Bill, to finance them require the help of local authorities, who are asked to utilize for the purpose credit that they possess in the rateable value of their districts. Therefore, the Joint Authority is an inferior creation to the Power Company. The Bill is a clear recognition that the electricity reorganizing schemes are not so sound as politically represented; were they so, the outside financing project would not be required. Lord Askwith sought to get the powers removed which are to enable local authorities to lend money and guarantee interest, as he prefers that private enterprise, financiers, and the big power companies should find the money. Lord Askwith, of course, is right. There has never been anything of this sort done before. The whole principle (if so it can be called) of local authorities becoming money-lenders and the guarantors of interest in respect of trading by other bodies is wrong; and it is an innovation that should be strongly resisted and rejected. In preventing the total removal of the power, the Government supporters were successful; but it is clear that the Government were prepared to extend to the opponents some compromise by limitation. So far as this goes, it is something gained; but we should have liked to see the joint authority tubs each showing sufficient inherent strength to stand financially on its own bottom. The amendments provided that the lending and guaranteeing powers should only apply to councils of county districts having populations of not less than 50,000; that the amount to be raised or guaranteed by a Council not an authorized distributor should be limited to an annual charge not exceeding 1d. in the pound; and that, in the case of authorized distributors, the liability should be limited by the amount of any capital charges of which they are relieved by taking a supply in bulk from the joint electricity authority, such amount to be determined by the Electricity Commissioners. This limitation has somewhat altered the complexion of the measure, as in it there is some—though far from sufficient—protection for the ratepayers. The electrical "extremists" and the believers in the potency of the super-power station and broadcast transmission theories, will not look with gratification upon the changes.

A Reward for Domestic Smoke Abatement.

Another article on the subject of clearing the air has appeared in "The Times" from the pen of Sir Napier Shaw. The reports that have recently been published relating to air pollution and means for diminishing it are the basis of the article. Sir Napier has arrived at the very sensible conclusion that this is a matter in which existing domestic smoke-producing conditions will not be overthrown and non-smoke-producing ones established by any revolutionary ordinance. Still on the other hand, as he says, it takes a long time to accomplish any work that depends upon the corporate action of a large community. Clearing the air of contamination is no exception. It is only upon individual voluntary acceptance of scientific precepts for avoiding the contamination of the air by smoke that the desirable end will be attained. This may be a tediously slow course; but if it is the only politic and practicable one—and committee after committee who have considered the subject are agreed that it is—then there is no option but to continue public appeal and education. It is concluded from recent investigations that domestic smoke is responsible for about two-thirds of the smoke problem. Sir Napier seems to have arrived at the view that health, cleanliness, prevention of waste of money due to dirt in the atmosphere, and the obviating of the deterioration of property by the acids contained in the foulness, are of themselves insufficient inducements to more rapid progress in air reform. He is doubtful, too, whether the problem can ever be satisfactorily dealt with by the application of penalties. Very poor success has attended the penalty system through seventy years or so. He thinks that encouragement should be given by reward—much in the same way that some traders attempt to encourage custom of their particular wares by accompanying a certain extent of purchase by a small present. The proposed mode of encouragement is that the assessment for rates of houses that make no smoke should be reduced in comparison with those that still pollute the atmosphere. True, the advantage of a system of this kind is that it would act automatically; but we have yet to find the local authority who would seek the power to do this, and to put it into operation. Perhaps local authorities owning gas undertakings would like to be pioneers in the matter. The action might add to the amenities of local government by raising a large amount of dissension and discontent among the ratepayers. We should probably find them divided into factions over

the matter; and in some cases there would be complaint that those who by using gas heating did not contribute to smoke pollution of the atmosphere were helping to make profits for the relief of the rates of those who do not care a jot how much smoke they create. Moreover, a change from one system of heating to another would be more the privilege of those who are well-to-do, and not of other people. Yet the former are those who perhaps less require a reduction of assessment than some of the others. Another difficulty would be that in the poorer class property, the rates for which are paid by the owners and not the tenants, the owners would reap the advantage, unless there was a reduction in the rent. We think Sir Napier Shaw had better seek another method of giving encouragement. We foresee difficulties in this one.

Nearing Par.

The market values of several gas stocks and shares are creeping up, and again getting within sight of par. Last Friday it was noticed that Tottenham "A" jumped up 7 to 95-100, and South Suburban ordinary was quoted at 91-96.

Imported Gas Mantles Exempt.

Last Friday, the Lord Chief Justice, Mr. Justice Sankey, and Mr. Justice Greer had before them a special case which raised the important point, under the Safeguarding of Industries Act, as to whether gas mantles should be included in the schedule of articles which, when imported, are subject to duty. In the result, as will be seen by the report in our "Legal Intelligence" to-day, the Court decided that gas mantles do not come within the operation of the Act. They will therefore be exempt from duty. The National Gas Council, who were opposed to the inclusion of gas mantles in the schedule, were represented by Mr. J. Hunter Gray, K.C., and Mr. Jacques Abady.

Railway Classification of Gas Apparatus.

The Society of British Gas Industries have been busy before the Railway Rates Advisory Committee regarding the new classification of goods for railway rate purposes. Generally speaking, they sought a lower classification than proposed for such things as coal and coke breaking machinery, coal and coke conveyor chains, washer-scrubbers, suction-gas plant, and gas-stoves of various descriptions. We are sorry the Society were not more successful. They ought to have been in view of the fact that there is nothing about the types of plant mentioned in the nature of refined machinery which requires an immense amount of care. Sympathy with the Society's submissions was not shown by the decisions of the Advisory Committee. The issues of the discussion will be found in the report in our "Miscellaneous News;" but it will be noted that the new classification does not come into operation for two years.

Gas Coal Position.

From all the coalfields the report comes that the position is strong of the best qualities of gas coals. In the Yorkshire area there has been more inquiry for unscreened. Generally speaking, however, the volume of business is showing a considerable falling-off.

Unemployment in the Coal Industry.

It is growing less—steadily, but surely. On the colliery registers at Feb. 25 there appeared 1,074,662 workers—a 1 p.ct. increase on the figures that obtained a month earlier. The "Labour Gazette" states that the percentage of unemployed among the insured workers of the industry on Feb. 21 was 9·4 p.ct. This compares well with other great producing and manufacturing industries.

Miners' Hours.

There has been a revival of the suggestion that, in order to reduce costs owing to the economic conditions of the mining industry, the working hours of miners should be revised. The Secretary for the Mines Department (Mr. Bridgeman) is not of that opinion. In the House of Commons recently, he declared that output had been rising considerably, and was now almost as great under the seven-hour day as it was previously under the eight-hour day. The seven-hour day has proved itself to be a mistake. One has only to test it by average man production and average ton cost in wages. Though the one has lately risen and the other has been reduced, neither is what is necessary. The country has been paying dearly for the change to a seven-hour day, ever since its institution. One authority calls attention to another aspect of the seven-hour day. He says that the attempt to secure a maximum output in seven hours tends in some cases to hurry and confusion, which are calculated to have a prejudicial effect on the safe working of the mines. "Speeding-up" may lead to an increase of accidents, to say nothing of the dissipation of effective effort. Steady, honest work spread over a working day of eight hours would, it is calculated, give the best result.

The American Coal Strike.

This only indirectly affects this country. It seems that it is bound—at any rate—temporarily to cause an increase of demand for coal for export. The latest reports to hand state that there is little chance of an immediate settlement. The President of the United Mine Workers of America (Mr. Lewis) declares that the strikers are determined to persevere until their demands are conceded; and he prophesies that America will be face to face with a coal famine in six weeks, if non-production continues.

Rout of the Extremists.

In the recent London County Council elections, and last week in the Metropolitan Board of Guardians elections, the ratepayers dealt a heavy blow at the apostles and would-be practitioners of Communist theories, and sent many of them out of the business of local government conducted on methods which mean unjustifiable burdens on the ratepayers. Poplar and Shoreditch in the guardians elections were the only exceptions in the wholesale defeat. Well-instructed, intelligent workers will welcome this. They know full well that Poplar methods of finance are not good for the country, nor for the workers themselves. Rates of relief pay which act destructively on the incentive to work are not good for men, industry, or the national welfare. Labour has its part to take in the constructive work of the country; and intelligent labour knows that constructive work cannot be conducted on an uneconomical basis. To attempt this means the promotion of unemployment and inevitable disaster. "Co-partnership" has a very big and profound meaning. It does not mean, for example, filching from other people their rights, or denying to capital liberty in managerial functions. The Amalgamated Engineering Union is looking more foolish as the days of its stupid blunder and adventure come and go.

Fair Play for British Dyes.

A good many people are critical and unsympathetic towards British Dyes, Ltd., and, in fact, the dye industry generally. They discern in it everything that is inferior to the German industry. But the country, the war emphatically taught us, needs the industry not only in times of peace, but in times of war. This is a point the critics appear careful to ignore. At the present time the British dyes industry is passing through a most critical stage, owing to the depreciated currency of Germany, and the dumping that at one time—only just lately, before protection was given to the industry—was going on for the express purpose of trying to arrest British dyes progress, and to wipe-out the industry in its infancy. There will therefore be a good deal of sympathy with the appeal of Brigadier-General Sir William Alexander that the British dyes industry should have "a fighting chance." An exhibition of some of the accomplished work was held last week at the Savoy Hotel. There was a luncheon, and some speeches. It was shown that the industry's research chemists have achieved a considerable amount of success, and have demonstrated again and again the close union there is between research and industrial need. Manufacturing efficiencies have been elevated; products have been improved and cheapened. And there is confidence that, with a return to more normal international finance, the industry will be able to compete with foreign productions.

Our Stock and Share List.

It is our desire always to keep up-to-date the particulars appearing in our Stock and Share List. We should therefore be glad if Secretaries of Gas Companies would keep us promptly informed of any changes affecting capital which do not come before us in the ordinary course.

Electrical Policy and Ratepayers' Protection.

The Worthing Corporation have a good opinion of themselves in the matter of their electrical policy. We commend them for that policy. The local Gas Company have been trying, as the largest ratepayers in the borough (unless the Railway Company can claim the position), to ensure that that policy shall be continued, whatever may be the change in the constitution of the Corporation, and thus secure permanent protection. Local authorities change with time; and, with change of men, there frequently comes a change of policy. The policy of the Corporation is to make electrical revenue balance expenditure, so that the rates shall not be called upon to aid the undertaking. There have been lapses in the policy, despite the proclaimed sincerity of the Corporation in the matter; and there may be lapses again. But the Corporation are averse from having any statutory obligation placed upon them which would ensure the continuation of the policy in which they suggest they take so much pride. The Council have a Bill before Parliament in which they are asking for an extension of their area of electricity supply to a sparsely populated district; and the Gas Company look upon this as a piece of speculation which stands a good chance of being unremunerative. They therefore asked the Local Legislation Committee (as our parliamentary reports show) to insert a clause in the Bill which would, at all times and in all circumstances, ensure that receipts cover expenditure. But the Corporation, singularly enough, do not wish to be compelled to carry out the policy which they declare they have no intention of abandoning. The profession and the refusal to submit to statutory rule to continue the policy appear to us to clash. Being professedly so good now, the Corporation ought to be glad to make the policy secure so far as their successors are concerned. Mr. A. M. Paddon, as Counsel for the Gas Company, and Mr. William Cash, F.C.A., Chairman of the Company, made out a strong case for the insertion of the clause which they submitted; but the Local Legislation Committee decided against them. The cause for the Committee's action is one of those mysterious things for which no amount of reasoning by outsiders can find justification.

PERSONAL.

Our readers will be interested to know that on the 13th inst. Mr. Robert W. Wilson, Secretary of the Imperial Continental Gas Association, completes a period of 50 years' service with the Company, for over 26 of which he has occupied the post of Secretary. Although he will shortly be relinquishing the Secretaryship, his connection with the Association will still be maintained through his election to a seat on the Board of Directors. To our congratulations to Mr. Wilson and the proprietors of the Association, we may add that we feel sure that his many friends in the City and gas circles will never forget the tact and urbanity with which he has always received them, and his cheerful spirit of assurance during the war, when the affairs of the Association were at their lowest ebb.

Mrs. Thomas Glover, of Fitzjohns Avenue, N.W., wishes to acknowledge in these columns the great number of kind inquiries she has received as to her husband's health. Mr. Glover was taken suddenly ill, and underwent a serious operation in a Nursing Home on March 30. It will be a matter of satisfaction to his many friends to learn that he is making progress.

On the occasion of his leaving Deal to take up a position under the Dover Gas Company, Mr. J. J. Paterson, Manager of the Deal and Walmer Gas-Works, entertained the employees at the gas-works to a farewell supper at St. George's Hall. Over sixty members of the office and works staff were present, and spent a most enjoyable evening. Mr. Paterson presided, and was supported by his successor at Deal—Mr. J. F. Tyndall, late of Whitchurch (Salop). Mr. W. H. Dunn (the Accountant) said that in losing Mr. Paterson they were losing a real friend. During the three years he had been at Deal, he had shown them all much kindness; and on behalf of the office staff, he had pleasure in asking his acceptance of an aneroid barometer. On behalf of the employees, Mr. F. West (District Superintendent) presented Mr. Paterson with an oak roll-top desk, and cordially supported Mr. Dunn's remarks as to the friendly relations that had always existed. Mr. Paterson, returning thanks, said he would take with him very happy memories of the good friends among whom he had worked at Deal.

Mr. R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S., has been appointed to a seat on the Board of Messrs. C. & W. Walker, Ltd., of Donnington, and will in future occupy the position of Managing-Director.

Mr. George P. Lewis, consulting engineer and chemist, of No. 9, Dacre Street, Westminster, has been elected a member of the Society of Chemical Industry.

OBITUARY.

The Tunbridge Wells Gas Company have sustained a sad loss by the death, which occurred on Tuesday of last week, of Alderman William Henry Delves, in his 93rd year. He was first elected a Director of the Company in 1859, and had been Chairman since 1887. During this period of 63 years, he only missed attending Board meetings on nineteen occasions, four of which were during the years 1920 and 1921, on account of failing health; and it is particularly interesting to note that from May, 1889, to September, 1920, he had an unbroken period of full attendance for over 31 years. On his ninetieth birthday, he was presented by the Town Council with a portrait of himself in oils, together with an album containing the names of the subscribers. He was Mayor of the town in 1900, and made honorary freeman in 1910. Mr. Delves always took a very active interest in Corporation affairs, and in the welfare of the Tunbridge Wells Gas Company. He was about until three weeks ago, and up to the last enjoyed full possession of his faculties, which, in connection with financial matters, were very keen.

The funeral took place last Monday of Mr. Thos. Dawber, Assistant Manager of the Leyland Gas-Works, who died aged sixty years.

PRESENTATION TO MR. WALTER HOLE.

On Monday evening, March 27, at the Griffin Hotel, Boar Lane, Leeds, a large gathering of employees of the Leeds Gas Department, with several members of the Gas Committee, met to bid farewell to Mr. Walter Hole, and to wish him many years of good health, happiness, and contentment in his well-earned retirement. The function took the form of a smoking concert and presentation, and was presided over by Mr. R. N. Webb (the Manager of the New Wortley Works). The gifts comprised an illuminated address and a suite of Jacobean furniture; the address being the work of, and a splendid example of, the abilities of Mr. Chas. P. Tooley (the Manager of the York Street Works).

In making the presentation, Mr. C. S. Shapley (the Engineer and General Manager of the Department) said that, though his associations with Mr. Hole extended over only three-and-a-half years, they had been of the most cordial nature. Mr. Hole, in the 24 years that he had been Superintendent of the Mains Department, had accomplished a great amount of work, and had done it most carefully and thoroughly, as was clearly evidenced by the reduction of the leakage account and the general all-round satisfaction with the city's gas supply. The abilities of Mr. Hole, both theoretical and practical, were so well known, that he need not enlarge on them; but he would like to say that he considered it was an honour to the Department to have had with them so long the author of what was undoubtedly the standard work on "Gas Supply and Distribution." He closed with wishing, on behalf of all present, that Mr. and Mrs. Hole would live long, and always be accompanied by the best of health and happiness.

Alderman George Ratcliffe (the Deputy Chairman of the Gas Committee) said that it had been his pleasure to know Mr. Hole all the time he had been in Leeds; and as he was one of those responsible for the selection of Mr. Hole, he was happy to be able to say that he had never had the slightest regret for what he did. Mr. Hole had succeeded thoroughly. His abilities were most marked; and the Gas Committee recognized that they were losing a very valuable and highly-esteemed official. He joined in wishing Mr. Hole health and contentment for many years to come.

Aldermen Thaxton and Fountain (members of the Gas Committee), Mr. F. Cooper (Mr. Hole's Assistant), Mr. Jas. Ellis (Inspector), and Mr. R. N. Webb each spoke in most appreciative terms of Mr. Hole; and a letter was read from Alderman C. F. Tetley (Ex-Chairman of the Gas Committee) regretting his inability to be present, but eulogizing highly the valuable work that Mr. Hole had done for the City of Leeds, and his services as lecturer from time to time at the Leeds University.

In reply, Mr. Hole said it was a considerable astonishment to him that his retiring was marked by such an enjoyable function. He had intended quietly to lay down the reins; but somebody had prevented him from so doing. He sincerely thanked all the speakers for their kind words and good wishes, and would specially like to speak of the kindness and unfailing courtesy that he had always received from Mr. Shapley since he came to Leeds as Chief. It would be one of his most cherished memories. He would also like to thank his assistant, his office staff, inspectors, and all those employed in the Mains Department, for the whole-hearted manner in which they carried out their duties. They had always worked well together; and he could say that this was the reason for the Department's success. It would perhaps be interesting to know that, during his term of office, over 260 miles of mains (from 36 in. diameter downwards) had been added to the city's distributing system, and that leakage had been reduced by more than 50 p.ct., and was about the lowest in the country per mile of main. In conclusion, he would like personally to thank Mr. Tooley for the magnificent address, and hoped it would always be handed down, even if only for its artistic value.

Thanks to the Chairman and those so ably contributing to the musical part of the evening, brought a most successful function to a close.

ELECTRICITY SUPPLY MEMORANDA.

A BROAD outlook is taken by Mr. A. Hugh Seabrook upon the fuel problem. Those of his electrical contemporaries who take the narrow view, and hold that there is only one way of dealing with that problem, accuse him of rank heresy. But Mr. Seabrook has not fashioned his present ideas on an unexplored or irrational basis. He has examined the whole position with a practical eye; he has put old practices in the balance, and has found them wanting. In a lecture given at the East Midland Sub-Centre of the Institution of Electrical Engineers at Loughborough on March 28, he examines the power position from several points of view. In the first place he looks at water power, and finds this has nearly reached the maximum point of efficiency; inasmuch as modern turbines are able to convert 85 p.ct. of the energy in the water into useful work. Unfortunately, however, in this country this source of power is limited to comparatively small units; nevertheless, considerable additions to our available power could be obtained from water at a reasonable capital cost. Even 100 horse-power has its uses if near the point of application of the energy. What is wanted to-day is that engineers of all branches should get well into their minds the truth there is in this statement: "If only we could disabuse our minds of the illusion that nothing that does not run into hundreds of horse-power is of any use, we should get a more correct perspective of the problem, and be more capable of dealing with it in a commonsense manner." When we come to coal, and find that by the most fashionable system in use, only 17 p.ct. of the energy of the fuel is turned into work, this can hardly be regarded with equanimity, or as a triumph of engineering skill. This "fashionable system" is the burning of coal under boilers, and utilizing the steam in turbines. The lecturer asked whether 17 p.ct. was to be regarded as a standard in the future aspect of power production. While the answer is truly in the negative, practice is giving an affirmative answer by the building of increasingly large power stations, which results in a decrease of efficiency at the point where the power is used, owing to the fact that the larger the station, the larger has to be the area covered by the transmission system. It has by no means yet been proved that the transmission of electrical energy is cheaper than the mechanical transmission of coal. Sufficient water supplies too for operating large power stations are scarce near collieries. Also the more remote a power station is from the area where the energy is applied, the less chances are there of profitably using the waste heat—that is, the heat rejected at the exhaust. This all shows that Mr. Seabrook is an advocate of the small and medium sized power station situated close to the place where the power is to be applied.

Power Practices and Efficiencies.

Combined Gas and Electricity Supplies.

There were many striking points in the lecture, which assist one to think in fresh directions. It has often been advocated that big electric power stations should be erected near large electricity consuming works, or that the erection of large works near by should be encouraged. Large works have to consider other things besides power. They require facilities in the way of materials, labour, distribution, and so forth. They want to be near the markets for their raw materials and their own products. And Mr. Seabrook points out that the large factories near the power station would not eliminate the need for a transmission network to cover the whole area. It would appear to be much more to the point to urge that large heat-consuming works should be situated near the power station, so as to use the heat that must otherwise necessarily be wasted. This led Mr. Seabrook to discuss, not in detail but generally, the combination of gas and electricity stations. In his view the indications are that considerable developments will take place during the next few years in combining the production of electricity with that of gas. This is practicable in larger stations, as well as in very small stations; but the greatest development will probably be seen in the latter. Mr. Seabrook has, by investigation, had his eyes opened to a surprising fact. It is that there are over 700 districts in England and Wales and about 300 in Scotland and Ireland where, though there are gas-works, there are no electricity stations. The reason is undoubtedly that for the most part the districts are too small to support independent electricity and gas works; but wherever there is a gas-works, there is the nucleus of an electricity works. Often there is a site, sometimes buildings, always staff and organization, that in many respects are applicable to both businesses; so that it requires a comparatively small capital outlay and a minimum of operating cost to add an electricity supply to an existing gas business. In fact, in the vast majority of these places, electricity supply can be instituted on a sound financial basis only by production at the existing gas-works. Mr. Seabrook has examined a number of these cases; and in very few of them could a bulk supply of electricity from a neighbouring town compete with the price at which it could be produced at the local gas-works, using as fuel a bye-product of the manufacture of gas. Day by day many gas-works are using in their ordinary practice coke-breeze for steam-raising purposes; and are securing by it cheap steam (at a good efficiency) for the various purposes for which it is required on the works.

Common Sense, and Thermal Efficiency.

To attach an electrical supply to an existing gas undertaking is mere common sense, and common sense is proverbially dull. But it is undoubtedly good business from the owners' point of view, and (particularly in small places) from that of the public. In some cases, Mr. Seabrook informed his hearers, this is so well recognized that the public, through their local governing bodies, are actually inviting the local gas company to undertake the supply of electricity. The advantages from the engineering aspect are also material. The thermal efficiency is high because internal combustion engines can be used, working either on gas made from coke or town gas—a thermal efficiency much higher than that of the super-station, though not nearly so high as that of the combined heat and power (steam) station. In large combined gas and electricity stations which are beyond the economical capacity of internal combustion engines, steam power plant must, of course, be employed; but then the fuel can be coke breeze, so that against the low thermal efficiency of such a station can be set the fact that it uses a bye-product as a fuel, and no raw coal is consumed. There will have to be an adjustment of the existing relations between the gas and electrical sides, for the advantages of co-operation over antagonism are so obvious that one needs not to don the prophet's mantle to see and predict that such a *rapprochement* is not only inevitable, but that it is actually and already in evidence.

Waste Heat from Gas-Works.

From what has been said in the foregoing paragraphs, it will have been seen that the lecture was an extremely interesting one. The termination of that interest was not at this point. It ran on into the application of internal combustion engines, in connection with which the noteworthy point was made that in statistics recently published by the Electricity Commissioners the lowest coal consumption per KW.-hour was obtained at a small station run on anthracite gas. Power plants using refuse as fuel and waste-heat power stations were dealt with. In this connection, Mr. Seabrook referred to the large untouched field that there is in almost every gas-works through the waste heat from retort-settings and from hot coke. Gas-works, he declared, will very shortly (by reason of the great attention now being paid to fuel conservation in gas manufacture) find themselves supplied with all the power and steam they require by means of heat from their auxiliary plant; thus leaving the recoverable heat from retort-settings available for public use in the form of electricity produced from waste-heat boilers. As an example of what this may mean in cheap power, it has been calculated that in one large gas-works alone, 4000 H.P. per retort-house could be produced 24 hours a day for months on end, as once a setting is put into commission gas manufacture proceeds evenly and continuously for many months until it has to be laid-off for renovation or resetting.

Vision and the True Problem.

In the concluding part of the lecture, Mr. Seabrook contended that it is rash that steam-power stations should be so extensively built as they are being to-day, until existing resources have been more thoroughly investigated and explored. He urged that where smaller stations can, by combination with gas-works or by utilization of more or less waste fuel and heat, effectually meet local requirements, super-stations should not be constructed. The lecturer's vision of the future aspect of power generation is one wherein the mechanical, the gas, and the electrical engineer will each take a broader view of his vocation, and return to his calling of "engineer" without the qualifying adjectives that limit his outlook and narrow his views—not that he individually may be a "jack-of-all-trades," but that he may secure with his fellows that co-operation the lack of which must be costing this country untold millions. The problem is not one of power alone, light alone, or heat alone. It is a combination of all three; and, said Mr. Seabrook, "unless and until we realize that they are one and not three, we shall not be able to carry out our duty with credit to ourselves as capable engineers. The problem is in our hands, and the responsibility is great." What Mr. Seabrook urges is that there is no one solution of the problem, and that the most urgent appeal of the present day is that we miss no opportunity to secure the most efficient solution for every case by the most economical means.

Financial Obstacles to Electrical Development.

Mr. Arthur Wright, formerly of Brighton, and of maximum demand fame, has been spending several years in electrical consulting practice. He has now come out of his seclusion; and in the "Electrical Times" there has appeared a contribution from him on the subject of "Financial Obstacles to Electric Supply Development." It is perfectly clear that Mr. Wright's deliberate view is that cheaper money is more important to electrical development than cheaper coal. He hits straight from the shoulder regarding the super-power stations and coal economy. Much has been preached to the public about the salvation of the industry by building huge power stations; but nothing has been mentioned as to a far more vital subject—viz., how to raise the necessary capital for the extended supply contemplated. In Mr. Wright's view, the talk of super-power stations has hypnotized the minds of our parliamentary men and

the public, who have been taught that in this direction lies the cure of our backwardness as compared with other countries. Many do not realize that the cost of scrapping the old plant will have to be paid for out of the coal saved during the near future, that the "possible" saving on coal of ¼d. per unit will not be available for the reduction of charges until the scrapping has been provided for financially, and that the multitude of isolated distribution schemes and managements are apparently still to remain. Improved generation of electricity seems to have been the chief point in view; the distribution and financing have been left severely alone. If engineers would bear in mind that in large electricity supply business the inclusive cost of money, with proper provision for reserve, amounts to almost as much as the total costs of generation and distribution, they would, Mr. Wright thinks, delve deeper into questions relating to costs of capital and its economy. Here is a strong point: "Men with electricity supply training should have the necessary sense of proportion to appreciate that the effect of a reduction from 10 p.ct. to 9 p.ct. in the cost of their capital is about equivalent to a saving of 20 p.ct. on their coal bill, and that a 1 p.ct. improvement of their station load factor has the same monetary effect as a substantial reduction of their coal bill." The cause of this country being electrically behind other countries, Mr. Wright thinks, is the pernicious effect of the old Electric Lighting Acts and the intensely parochial spirit the purchase clause created. The Government, now realizing this, are endeavouring to rectify some of the old defects. Mr. Wright, however, feels that nothing at present is being done or even contemplated to remove the real trouble—viz., the discouragement to private capital and enterprise to enter the electricity supply field. The last thing that he expects to come down in price is money for enterprises such as electricity supply.

Finance and the Joint Authorities.

This does not look very hopeful; and the *impasse* Mr. Wright is of opinion is only to be negotiated by making it possible for private capital to be attracted. He is very much of the same opinion as ourselves regarding the financing of joint authorities. Future ratepayers are not likely to allow their rates to be mortgaged for large enterprises, far away from their towns, in which they have not the sole vote in the management, and which, moreover, may be for the benefit of competing towns. Private financiers, also, will not supply the capital unless its expenditure is wholly under the control of men elected by them. All suggestions to combine the financing and management under a joint board of municipalities and companies seem to him to be intrinsically unsound, as the purely local interests of the former, including the desire for contributions to the rates, are bound to conflict incessantly with the more general and distributed interests of the latter. Again, how can private capital be attracted by a joint authority most of the members of which are not directly answerable to the real lenders, and are, moreover, elected by their townspeople for very different reasons than that of having a sound knowledge of the electric supply business? No big business such as large-area electricity supply can be successful unless it is managed by a permanent board of big men who exclusively devote their time to its sole interest. The first step in the way of relief must be taken by the industry; and it is no use waiting for the Government to do anything more than they have done. The industry has a friendly Government atmosphere and keen Commissioners; but the move must come from the industry in the form of a united request for better encouragement for private enterprise.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Spring Meeting at Kilmarnock.

THE Spring Meeting of the North British Association of Gas Managers was held on Friday last, in the Art Galleries, London Road, Kilmarnock. Mr. CHARLES FAIRWEATHER (the President of the Association) occupied the chair; and the attendance was particularly large and representative. Supporting the Chairman at the outset of the proceedings were Provost Wilson (Kilmarnock) and ex-Provost Matthew Smith (the Convener of the Gas Committee of the Kilmarnock Town Council).

A CIVIC WELCOME.

Provost WILSON opened the meeting by extending a civic welcome to the members of the Association. In the course of a brief introductory speech, he remarked that, so far as Kilmarnock was concerned, they had been singularly fortunate in the town in relation to their gas undertaking. They had been fortunate not only in the development and progress of their undertaking, but especially in the men who had occupied the position of manager during the last half-century. It was rather an interesting coincidence that the meeting might be taken as a centenary in connection with Kilmarnock gas enterprise, because it was in 1822—a hundred years ago—that the undertaking was inaugurated. It was quite apparent to him that in those far-off days meetings of this kind could not have taken place, and the reason might be found in the circumstance that the gas managers or advisers of the period stuck works away on the very tops of hills. Now this was quite contrary to scientific theory; and the result was that some thirty years ago it was deemed advisable to remove the locus of the Kilmarnock works from the lofty altitude on a hill to a lower quarter of the town. The works were now conveniently and beautifully situated in the lower part of the borough. He commended the idea of periodical meetings of the gas managers of Scotland for the interchange of views, opinions, and experience on gas manufacturing questions. No community could live unto itself. Communities and individuals were all dependent on each other, and occasional meetings for discussion and debate were bound to be beneficial to the members of the Association. About eighteen years ago Kilmarnock was faced with the necessity of going in for electricity; and it was thought at the time the innovation was projected that the gas undertaking would materially suffer thereby. He was glad to tell them that that expectation had not been fulfilled, because, under the guidance of their able Gas Manager, the gas consumption of the borough of Kilmarnock had gone on increasing by leaps and bounds. No doubt the electricity undertaking had done an immense amount of good to the community, in coping with the demand for electric light and power; but so far as they could see in Kilmarnock, that good had not been effected at the expense of the gas undertaking. Results of this nature were very complimentary to Mr. Fairweather, because they showed he was ever on the outlook for new sources of consumption. Altogether the position was such that he felt there were few boroughs further ahead in their methods of producing gas or coping with the varied demands of consumers than the borough of Kilmarnock. It was his pleasure that morning to extend to the members of the North British Association, on behalf of his Corporation, a most hearty welcome to Kilmarnock; and he hoped the visit to the district would prove helpful and instructive.

The PRESIDENT briefly acknowledged the presence of Provost Wilson and his Gas Convener (ex-Provost Matthew Smith) and the cordiality of the civic reception. Thereafter the ordinary business of the meeting was proceeded with.

PAPERS AND DISCUSSION.

The PRESIDENT said they were now to have papers read to them by Mr. George Keillor, of Greenock, and Mr. John Richmond, of Penicuik, on the subject of "Gas Efficiencies." The topic the writers were touching upon was of living importance to-day; and he felt that managers would have their interest in the subject quickened by the papers and the discussion which was to follow. Members of the Association would have presented to them both sides of the question—one writer dealing with the virtues of low-grade gas and the other taking-up a stand on what they called high-grade gas. From these diverse views they would, he believed, find abundant scope for informative discussion.

The papers were read as follows:

Mr. GEORGE KEILLOR (Greenock) on "Thermal Efficiencies."

Mr. J. KICHMOND (Penicuik), "Notes on Gas Efficiencies."

Mr. T. W. HARPER (Ayr), on "Economies in Steam-Raising."

The first two papers, with a report of the discussion, are published on pp. 93-99 of this issue. Regarding Mr. Keillor's paper, the PRESIDENT said that it contained a mine of information. It was one which managers would do well to digest at leisure. The paper itself contained a great many hard facts, which particularly applied to present-day gas interests.

Mr. Harper's paper will be published next week; the discussion on this was postponed to a subsequent meeting.

VACANCIES IN THE COUNCIL.

For five vacancies in the Council the following nine gentlemen were nominated: Messrs. H. H. Gracie, Edinburgh; G. Bruce, St. Andrews; J. Richmond, Penicuik; S. Dickie, Dumfries; J. D. Keillor, Hawick; J. Bell, Dumbarton; A. S. Nesb t, Paisley; H. G. Ritchie, Falkirk; R. Barr, Ardrossan.

It was announced that the ballot would be held at the annual meeting in September.

THE LUNCHEON.

At half-past one o'clock the members of the Association adjourned to a larger hall in the Art Galleries, where, through the kindness of the Provost, Magistrates, and Town Council of Kilmarnock, a substantial lunch had been provided. Provost J. B. WILSON was in the chair.

Mr. JOHN M. SMITH, in a felicitous speech, proposed "The Provost, Magistrates, and Town Council of Kilmarnock;" and Provost WILSON made a happy acknowledgment.

Ex-Provost MATTHEW SMITH gave "The North British Asso-

ciation of Gas Managers," coupled with the name of Mr. Fairweather, the President. Taking a broad view of the situation, it seemed to him, remarked ex-Provost Smith, that the future of gas undertakings was fairly sound.

Mr. Fairweather, in the course of his reply, remarked that gas managers and all members of the North British Association recognized that they had a dual capacity. Not only had they to satisfy the public bodies under whom they served, but, as representing an undertaking of public utility, it was a very responsible part of their work to satisfy the gas consumers and keep them fully contented. This was the view the members of the Association took of their responsibilities; and for many years they had all faithfully endeavoured to maintain that standard.

Visit to the Kilmarnock Gas and Electricity Works.

Following the luncheon the company visited the gas and electricity works at Riverside, Kilmarnock. Altogether, the spring meeting was a decided success, and the completeness of the arrangements testified to the assiduity and energy of the Secretary, Mr. David Fulton, of Helensburgh.

KILMARNOCK CORPORATION GAS DEPARTMENT.

It is interesting to note that this year is the hundredth anniversary of the supply of gas in Kilmarnock. The first meeting to promote gas supply in Kilmarnock was held on May 29, 1822. A site was selected at Langland Street, and the erection of a works was proceeded with; and it is interesting to note that an early firm of gas engineers and contractors was Messrs. Bickett, of Kilmarnock, whose work in this connection was well known all over Scotland. The gas supply to Kilmarnock was successfully conducted by the Gas Company up till 1871, when the undertaking was purchased by the Corporation at the price of £45,000. The old gas-works at Langland Street were overhauled and revised by the Corporation, and worked successfully up to about the year 1900, when it was apparent that the site was becoming restricted, and that a new one was necessary. After some negotiations, land was purchased and a relief station erected at Riverbank, which was set to work on May 10, 1904. The relief station was extended and added to, and it was found advisable to transfer the whole of the gas undertaking to Riverbank, which was duly accomplished; the complete works being inaugurated on March 26, 1910. Since that date, various important extensions and alterations have been carried out. It is noteworthy that in establishing railway connections, the Corporation have kept in view the railway service to the two Departments of the Corporation—*i.e.*, the gas and electricity works, and a joint railway and sidings now serve the two Departments. The most recent addition at the Riverbank gas-works is a blue water-gas plant (by Messrs. Humphreys and Glasgow), which has been working successfully since November, 1921. The original works were equipped with horizontal retorts on the "Siemen's" principle; the later addition to the horizontals being built by Messrs. Robert Dempster & Sons, of Elland, who also subsequently erected an installation of intermittent vertical retorts on the "Elland" system, and which are now at work. The works are equipped with the usual residual products plants, such as sulphate of ammonia recovery, tar dehydration, and benzole and naphtha recovery; and in this respect it is also noteworthy that the Kilmarnock gas-works are among the first in Scotland to recover sulphate of ammonia and to distil naphtha.

Another feature of interest in the Kilmarnock gas-works is the fact that the blue water-gas plant works without the assistance of a relief gasholder. The addition of a relief gasholder was quite possible; but in order to couple up this useful adjunct, it would have been necessary to lay about a mile and a quarter of gas-main, at a cost of from £5000 to £6000. At the moment, the Corporation are unwilling to do this; and therefore the Department, in manufacturing water gas, are mixing it direct with coal gas, and sending it to the town.

The area of land owned by the Gas Department of the Kilmarnock Corporation, and on which the Riverbank gas-works are built, amounts to 16¼ acres, and is situated at the junction of the Irvine and Kilmarnock Waters, which together form the River Irvine. The land was originally low-lying and at times flooded, with the result that, in building the works, the Corporation had to raise the level about 6 ft., so that the works level might be safe from the disastrous results of flooding.

Electricity Department.

The Kilmarnock Corporation electricity works were inaugurated in the year 1904, and were intended at that time to be entirely for Burgh supply. Since that date, however, the policy of the Kilmarnock Corporation has been altered, due to changing circumstances; and in the year 1914 they obtained powers to supply electricity in certain parts of Ayrshire, including Galston, Newmilns, Darvel, Troon, and Irvine. To meet this additional load, it was found necessary at that time to consider afresh the method of extending the central generating station; and the result was that the extensions to the station were designed on broader lines.

Transmission lines were run to the various Burghs, and when these had been completed, and the supply made available, it was at once found necessary to consider further extensions. The demand for current continued to such an extent that, in the year 1919, large extensions were commenced, and orders were placed for a 12,500 kw. turbo-alternator, together with two large water-tube boilers. New buildings were erected on a comprehensive scale. The whole scheme is now almost completed, and the new plant will shortly be at work.

The coal for the new plant is delivered into wagon tippers, and elevated to overhead bunkers of a capacity of about 600 tons. From the bunkers the coal falls by gravity down the shoots into the boiler hoppers, and thence to the grate; the resultant ashes being dumped into a small ash breaker, and sucked into a large overhead ash bunker over the railway.

The steam pressure now worked at is 250 lbs. per sq. in., and the generating plant consists of:

One 1,500 kw. turbo-alternator.
,, 2,500 ,, ,, ,,
,, 5,000 ,, ,, ,,
,, 12,500 ,, ,, ,,

The area of supply is approximately 500 sq. miles of the County of Ayr, and the length of overhead line is about 90 miles.

It may be interesting to know that the Kilmarnock Corporation was the first Corporation in the British Isles to supply electricity to such an extent outwith the burgh boundary, and the Department has the largest municipal supply area, as well as the largest system of high-tension transmission in Great Britain.

The Electricity Department very kindly put their works at the disposal of the members for inspection, and the party were personally conducted over the works by Mr. W. C. Bexon, the Corporation Electrical Engineer and Manager, whose courtesy was greatly appreciated.

Lampblack Extraction in Oil-Gas Making.

Oil gas is manufactured by the San Diego Consolidated Gas and Electric Company; and lampblack is extracted from the water through which the gas is passed in the wash-box and scrubbers. In the Company's magazine, Mr. R. C. Cavell explains that the water in the wash-box (that used is salt water from San Diego Bay) cools the gas and removes from it the finer particles of carbon, or lampblack, which are in suspense in the gas when it leaves the generator. On leaving the wash-box the water contains about 1 p.ct. of lampblack, and is pumped into filters of the Oliver vacuum type. The filter structure consists mainly of a rotating cylindrical drum 12 ft. in diameter by 18 ft. in length. The drum is made up from wood staves with holes drilled in them, and covered with canvas. The wash-water is directed upon the outer surface of the revolving drum; and a series of suction-pipe openings on the inner side draws the water through the canvas, filtering out the lampblack, which is left adhering to the outside of the drum. As the drum revolves, the lampblack is carried to a point where it is scraped and air-blown from the canvas. The process produces a lampblack mass containing about 50 p.ct. of water; and from the filter this is conveyed to a dryer, consisting of a rotating cylindrical steel shell 6 ft. in diameter by 42 ft. in length. Through the heated interior of this shell, the lampblack slowly travels, emerging with about 10 p.ct. of moisture. After this, the lampblack is briquetted in a press, and then used in the manufacture of water gas. The water from the filter still contains a trace of lampblack, and so is run into settling pits from which the accumulation of lampblack is periodically removed and used as fuel under the boilers of the steam plant.

Scottish Junior Gas Association (Eastern District).—At the annual general meeting of the Association, to be held in the Heriot Watt College, Edinburgh, next Saturday afternoon, Mr. R. B. Chalmers, of Falkirk, will read a paper on "An All-Gas House." The paper read by Mr. J. J. Scott at the last meeting entitled "Deposits in Steel Mains and Services," will also be discussed.

Association of Statutory Inspectors of Gas-Meters.—The annual meeting of the Association of Statutory Inspectors of Gas-Meters will be held in the Board Room, Gas-Meter Testing Station, London Road, Manchester, at 10 a.m. on Thursday, June 1 next. A conference with representatives of administering authorities will be held in the afternoon at 3 p.m., when a paper will be read by Mr. F. Coe, Official Inspector for Nottingham, entitled "The Past and Present of Gas-Meter Testing."

Practical Instruction in Gas Manufacture.—Mr. Samuel Insull, of the People's Gas Company of Chicago, deplores the disappearance of the old apprentice system, and the lack of practical knowledge which he has to face on the part of graduates. Without wishing to belittle the influence of technical instruction, he says he cannot forget that some of the great leaders in railroad building and in the construction of power plants and the development of the chemical industry, are men who started at the bottom and gained a practical knowledge at the same time that they gained their technical knowledge. Holding these views, he has stated his readiness, in order to stimulate interest in technical subjects in colleges, to place at the disposal of local and neighbouring institutions of learning a complete gas-works, generating station, and laboratory, to be operated by professors and students during the long summer vacation. School authorities in Chicago are forming plans for the acceptance of the offer, which was made with the proviso that any production of gas or electricity would not cut into the supply of the commercial plants. The offer was also made "on a basis of sufficient remuneration to cover the expenses."

THERMAL EFFICIENCIES OF GAS PRODUCTION AND USE.

[Papers and Discussion at the Meeting of the North British Association of Gas Managers, last Friday.]

THERMAL EFFICIENCIES.

By George Keillor, of Greenock.

When I was asked if I would prepare some notes for the purpose of this discussion, I called for a definition of the title submitted ("Gas Efficiencies"), because it appeared to me to be too wide a text, and rather ambitious a subject, for the short spring meeting of the Association. To put up a case in proper form for low *versus* high calorific value, gas would require more research and preparation than a busy engineer has time for. Moreover, a vital subject like gas efficiencies should not be talked on, but debated, if a definite settlement is aimed at. Perhaps a discussion on either or all of the invaluable reports of the Gas Investigation Committee would have been a most excellent exercise and served equally well the purpose of the meeting. A definition or limitation of the title not having been vouchsafed me, I am afraid my notes may be contrary to expectation. They may, however, provide matter for a satisfying discussion.

The "Charter of Liberty."

Ever since Murdoch proved the practicability of gas lighting, the question of gas efficiencies has been much and often discussed; but never perhaps in the long history of the industry has there been more need than to-day for a searching examination of the problem. In the past—indeed, almost from infancy—the gas industry, owing to legislative interference, has not had an opportunity to develop its resources. To-day, however, matters are different. No longer is the road to progress and higher efficiencies barred by effete legislation. The barriers which so long resisted the assault of peaceful persuasion yielded at last; but only to the strain of world-wide tumult and strife. And as a result of this last-hour discovery, the gas industry suddenly became one of immense national importance. Its power to succour the country in its homeric fight for world freedom, and also its ability to assist in times of domestic strife as well as in times of peace, could no longer be ignored. It had to be recognized; common justice demanded it. And thus, out of the agony of nations and the country's peril, there was born the Gas Regulation Act in 1920. Under this munificent Act the present day engineer has great scope for the exercise of his genius. He has at his command an instrument of immense possibilities—something denied to previous generations. Under its guidance the opportunities for advancement are almost unlimited. But in the absence of an improved personnel and desire, if we lack discernment, enthusiasm, and faith in our profession, the Act of 1920—the "Charter of Liberty" as it has been called—might as well never have been born.

It may or it may not be true to call the Act a charter of liberty to the gas industry; but whether or not we agree, there is no alternative to its adoption, and all statutory undertakings must obey its commands some time after August, 1922. Thereafter, I should not be surprised if a Special Order is passed to rope in non-statutory undertakings as well. Only then—unless we already realize it—shall we appreciate the material and economic differences between volumetric and thermal methods of working. It would appear, therefore, that the hunt for therms is going to be a much more exacting and scientific business than the mere plebian task of collecting cubic feet. So that if therms are really more difficult to collect and trade with than cubic feet, it may well explain the reason why so few undertakings have availed themselves of the "liberty" the Gas Regulation Act provides. Uniform practice and efficiency in the production and use of town gas will only be obtained when every gas undertaking, large and small, is trading on the therm basis; and not until that time arrives can we say that all the barriers to progress and higher efficiencies have been removed.

Delay in Adoption of the Act.

Are we then well advised in delaying the adoption of the Act? On the question of "delay," Bacon has it that "It were better to meet dangers half way, though they come nothing near, than to keep too long a watch upon their approaches; for if a man watch too long, it is odds he will fall asleep." Now, as a general rule, gas engineers are eager, ever ready, and prompt to adopt measures and methods which are of proved administrative and economic value. But I see no eagerness to adopt the emancipation Act of 1920. Have we fallen asleep? It surely cannot be said that we would rather not now have the Gas Regulation Act, because it appears to favour the buyer more than the seller, and because it calls for the more stringent and scientific supervision of processes. Neither can it be said that we fear the public wrath if the gas-consuming public, so long accustomed to the volumetric basis of charge, are impelled to adopt the new legal, and perfectly fair, thermal basis of charge; nor that gas engineers are incapable of making up their minds as to the relation between the efficiency of the manufacturing process at command, and the efficiency of utilization of the gas to be supplied, having regard to ultimate results, both practical and financial. With one voice we shout aloud for liberty from legislative oppression and suppression; but with another voice, and with the mandate of liberty in our pockets, we murmur: Don't adopt the new Act voluntarily; let the old order prevail; let well alone. Surely a more Gilbertian situation has never arisen!

Is there an answer to the riddle? There is certainly speech abroad that the volumetric price basis being a simpler and more elastic dividend or profit-earning medium than the statutory thermal price basis, many engineers would rather succumb through over-exhaustion than voluntarily adopt the Act and take part in the more exacting hunt for therms. I do not say that that is an answer to the riddle; but I give it for what it is worth. I have reason to believe, however, that the engineers in Scotland, to whom we usually look for a lead, are now giving the matter their serious consideration. And not without time, for the sooner we recognize and admit our obligations under the 1920 Act, the sooner shall we attain maximum and uniform efficiency in gas production and utilization. The adoption of the Act is the first practical step towards higher gas efficiencies, and I daresay to higher professional status as well.

After adopting the Gas Regulation Act and obtaining a fair maximum selling price per therm, perhaps the most important question of all remains to be decided—viz., what quality of gas shall we supply? During the war and the coal strike periods new and invaluable experience was gained in the production and distribution of gas for town's use. Consequently little difficulty should now be experienced in determining a standard of quality to meet particular requirements. Of course, much depends upon the type of plant employed, the average quality of coal available, the relative values of raw material and residual products, and last, but not least, the capacity and condition of the holders, mains, services, and measuring appliances. It would appear, therefore, that the determining factors are cost of production and the ability of existing appliances to give maximum efficiency in use with whatever C.V. is declared; but deficiencies in the distributory system should not be allowed to stand in the way of a cheap, abundant, and efficient gas supply if such can be provided at calorific values lower than 450 B.Th.U.

Relativity of High and Low C.V. Gas.

In my opinion, the time has long since passed for debating the relativity of high and low C.V. gas. Prior to the passing of the Gas Regulation Act, this meant high and low candle power gas; but since the passing of the Act, the expression has quite lost its significance. A 550 C.V. gas gives good illumination in a flat-flame burner; but if a non-luminous 550 C.V. gas could be substituted, it would be a far better public utility servant than the luminous gas, if for no other reason than that it would prevent the sooting of burners and the messing of fitments so dreadfully common in towns where high quality gas is still supplied, and where little or no attention is given to burner adjustment. Naturally, where you have sooting you have incomplete combustion, disagreeable odours, and excessive heat losses. This, then, is why some advocates of low C.V. gas say that the volume used does not increase when the C.V. is reduced. Personally, I do not think they are right. There is a difference in the volume of gas metered; but, in my opinion, it is not in direct proportion to the drop in calorific value. Gas of low C.V. has a certain virtue which is absent in high C.V. gas when used under ordinary domestic conditions; and that virtue prevents the difference in volume being too marked. Efficiency in use must also be considered.

It is a truism, of course, that the consumer is just as well off with gas in concentrated form as he is with gas in less concentrated form so long as he obtains it on a comparative price basis, and so long as he can utilize either gas equally efficiently. But can he? There is the rub. If all domestic appliances were so perfectly adjusted as to give equal burner efficiency, then only 182 c.ft. of 550 C.V. gas would require to be produced and used to do the same work as 250 c.ft. of 400 C.V. gas. But because gas of 550 C.V., priced at 5s. 6d. per 1000 c.ft. costs the same per therm—viz., 1s.—as 400 C.V. gas, priced at 4s. per 1000 c.ft., it does not follow that the 550 C.V. gas is of equal value to the consumer as an article of everyday use. I am of opinion that it is not so; and I challenge the advocates of high C.V. gas in Scotland to prove the contrary. We have had enough of supposition. Let us now have the proof.

A mere repetition of the scornful and ill-informed speeches made at the last annual meeting of the Association will not carry us any further. The assertiveness on that occasion surprised me greatly; and perhaps the most astonishing utterance of all was "that when the standard of gas went down to 420 or 440 B.Th.U. it was not a credit to any gas department, and it only tended to bring the gas industry into disrepute." This was not spoken as a pleasantry. It was uttered as the deliberate opinion, the settled conviction, of a serious-minded expert engineer. But even captains of the industry have to be careful of their speech lest they mislead their followers; and an avowal like the one just quoted is only permissible if the speaker at the time of utterance produces abundance of proof in support of it. I myself supply gas of less than 420 B.Th.U. with most excellent results; but in doing so, I do not think I have lowered the repute of gas or of the profession. Rather the reverse. Of course, there are scores of

engineers similarly placed who regard such speech as unwarranted and unjustifiable.

The following interesting table was calculated to show the difference in volume which has to be produced at various calorific values when there is a demand on our carbonizing plant for 8000 therms per day. It also shows the therms produced per ton of coal at varying yields per ton when manufacturing 8000 therms per day of varying gas qualities. It does not, however, deal with the efficiency of utilization and the effect that this factor has upon volume delivered.

Percentage Differences in Gas Volume.	Volume C.Ft.	B.Th.U. Gross.	Total Therms.	8000 Therms Available.			Cubic Feet per Therm.
				From Coal Required.	At Various Makes per Ton.	Yielding Therms per Ton.	
				Tons.	C.Ft.		
0·00	2,000,000	400	8000	66·6	30,000	120	250·00
0 000				80	25,000	100	,,
				100	20,000	80	,,
				105 3	19,000	76	,,
				111·1	18,000	72	,,
				117·6	17,000	68	,,
				121·2	16,500	66	,,
5·88	1,882,351	425	8000	94·1	20,000	85	235·29
5·888				99·1	19,000	80½	,,
				104·5	18,000	76½	,,
				110 7	17,000	72¼	,,
				117·6	16,000	68	,,
				125·5	15,000	63¾	,,
11·11	1,777,777	450	8000	98·7	18,000	81	222·22
5·555				104·5	17,000	76½	,,
				111·1	16,000	72	,,
				118·5	15,000	67½	,,
				127·0	14,000	63	,,
15·79	1,684,211	475	8000	99·1	17,000	80¾	210·53
5·263				105·3	16,000	76	,,
				112·3	15,000	71¼	,,
				120 3	14,000	66½	,,
				129·5	13,000	61¾	,,
20·00	1,600,000	500	8000	100	16,000	80	200·00
5·000				106·6	15,000	75	,,
				114·3	14,000	70	,,
				123·1	13,000	65	,,
				133·3	12,000	60	,,
27·28	1,454,545	550	8000	111·9	13,000	71½	181·80
9·097				116·4	12,500	68¾	,,
				121·2	12,000	66	,,
				126·7	11,500	63¼	,,
				132·2	11,000	60½	,,
				145 4	10,000	55	,,
				161·6	9,000	49½	,,
33·33	1,333,333	600	8000	121·2	11,000	66	166·6
8·051				133·3	10,000	60	,,
				148·1	9,000	54	,,

Economic Production of Therms.

To my mind, the question of moment to-day is not altogether the relative efficiency of utilization of high *versus* low C.V. gas, but rather the potentiality of existing plant in the economic production of therms per unit of plant. That is the problem we, as engineers, have to solve; and as it is now the one thing which matters, it is the bounden duty of every engineer to wrestle earnestly with the law of economics as it affects production in his own particular works and environment. It is undoubtedly true that where horizontal and old-type vertical retorts are in use, the thermal efficiency will be lower than with modern installations designed for the efficient steaming of the charges within the retorts; but this need not deter any of us from trying to improve our efficiencies with the plant at our disposal.

As an advocate of gas in concentrated form, we have the splendid example of the South Metropolitan Gas Company, with its 550 C.V. standard and its magnificent yield of 70 therms per ton of coal carbonized in horizontal retorts. If similar coals were carbonized in modern vertical retorts in England, I do not know what the therm yield per ton would be; but in Scotland, with average coal of poorer quality, we are told that undertakings selling on the therm basis are obtaining 76½ therms of 460 C.V. gas. Then we hear of others with as yet no fixed standard, obtaining 80 therms per ton of 400 C.V. gas. There is yet another class—a class by itself, I admit, but visionary without a doubt—who claim at present 100 therms per ton of about 400 C.V. gas. Abnormal results such as these, however, need not dishearten us, because similar claims in the past have been proved to be unattainable from day to day and from month to month. Of course, it is well to aim at such results; but so far they are purely experimental, and we can well afford to sidetrack them in our honest quest for efficiency in gas production.

Before doing so, however, and because of the unreal atmosphere created by the unwise and premature announcement of immoderate results, it would be well to recall a few examples. But first of all let me say that only gas engineers employed in the vicinity of a super gas-station know what it means to be pestered by pragmatists; and it will cause no surprise when I say that on several occasions it has been found of vital professional necessity to rebut the visionary results put forward as established gas-works practice by management committees and newspaper scribblers acting in ignorance of the real facts. Let me give you two examples of overstatement: At one time it was alleged that 20,000 to 25,000 c.ft. of 450 to 460 C.V. gas was a matter of every-day practice. Then I remember being present at a meeting of Scottish Gas Managers in April, 1919, when the sensational announcement was made that a yield of 30,000 c.ft. of 400 C.V. gas, with a sale of over 6 cwt. of coke per ton of coal used, was settled practice; and not the least noteworthy feature of the statement was that the gas contained less than 12 p.ct. of inerts. Unusual and unverified results such as these simply challenge criticism; and when studiously and publicly announced, they cannot be passed over without comment. Three years have elapsed since these statements were made; and as we are all anxious and ready to adopt a system capable of providing such results, it would be advantageous to have unimpeachable proof of their practicability. If in the interval it has been found impractical to produce these abnormal results in ordinary every-day gas-works practice, then I think that we, as professional men, are justified in asking for their public withdrawal. Moreover, in view of the fourth report of the Gas Investigation Committee on the efficiencies of processes for manufacturing gas at Uddingston, Test 5 on the wet basis, and the Plimsoll line of the series, I think we may safely jettison all claims which exceed it. A make of 19,593 c.ft. per ton of 410 B.Th.U. gas (80·33 therms) from average Lanarkshire double nuts is the only certified result we have obtained so far; and it must hold the field until something better and equally reliable takes its place.

In our search for higher thermal efficiency per unit of plant I am afraid we shall have to rule-out the idea of coal conservation. If this were still demanded by the State, it would enable us to approach the subject in a different way. Large yields per ton of low calorific value gas would then be the rule. But I am afraid this important factor in the case is now of secondary importance. Of course, it does not follow that big yields of gas per ton of low heating value are more profitable to produce and trade with on a therm basis than lower yields of higher C.V. gas. Moreover, it appears that the total therms producible per unit of vertical plant are about the same when the yields are low (12,000 c.ft.) and the calorific value high (500 C.V.), as in the case of high yields (20,000 c.ft.) and low calorific value (400 C.V.).

The following statement, based on figures supplied to me by engineers in charge of vertical retort installations in Scotland, and calculated as for a daily make of 2 million cubic feet in a two millions per day vertical plant, may help to illustrate the point. Purification, steam raising, and repairs are excluded; but all wages from the coal-wagon to the coke heap, including the supervision of electrical plant, a high standard of cleanliness, and a proportion of foremen's time, are allowed for. Coal is taken at 26s. per ton delivered, and residuals are allowed for at yard price—coke, 20s. per ton; tar, 21s. per 100 gallons; and sulphate £7 net per ton.

—	1	2	3	4	5	6	7	8	9	10	11	12
Gas per ton, corrected, c.ft.	12,000	13,000	15,000	16,000	17,000	16,500	14,000	17,000	20,000	17,700	19,593	17,000
Calorific value, gross	500	480	455	410	400	414	465	438	400	430	410	460
Total therms	10,000	9,600	9,100	8,200	8,000	8,280	9,300	8,760	8,000	8,600	8,200	9,200
Therms per ton of coal	60	62·34	68·25	65·6	68	68·31	65·1	74·76	80·0	76·11	80·33	78·20
Cost per 1000 c.ft., pence	14·290	13·247	12·03	11·042	10·614	10·969	12·302	10·614	9·618	10·068	8·755	8·998
Cost per therm made, pence	2·858	2·760	2·743	2·693	2·653	2·649	2 646	2·423	2·404	2·341	2·140	1·956

The figures in column 1 are makers' guarantee results with first-class coal—no steaming. In column 11 the figures are on the basis of the Gas Investigation Committee test No. 5 at Uddingston. The figures in column 12 are so noteworthy with average steaming that I give you the stated yield of residual products available for sale: Coke, 8 cwt.; tar, 19·86 gallons; sulphate of ammonia, 50 lbs. A mixture of the gas in columns 1, 2, 3, 4, 7, 8, 10, 12, with blue water gas made in a separate generator to give 400 C.V. gas, yields the following calculated results:

—	1	2	3	4	7	8	10	12
Yield per ton of coal, corrected, c.ft.	24,001	23,188	23,068	17,777	23,310	22,588	22,988	26,983
Calculated C.V., gross	400	400	400¾	399	399	403½	400	400
Total therms	8,000	8,000	8,015	7,980	7,980	8,070	8,000	8,000
Therms per ton of coal	96·0	92·75	92·44	70·93	93·0	91·5	91·95	107·93
Cost per 1000 c.ft., pence	10·907	10·745	10·373	10·696	10·415	9·813	9·495	8·431
Cost per therm, pence	2·726	2·686	2·588	2·680	2 610	2·432	2·374	2·107

Some engineers make a point that in the production of low C.V. gas as compared with high C.V. gas, labour and maintenance charges are less. As regards labour charges when running a fully-equipped vertical retort installation, I should say that wages are practically the same whether the installation (in our case a two million cubic feet per day unit) is half in use or in full use. As regards maintenance, there is undoubtedly a saving owing to fewer retorts being in use; and perhaps this saving is discounted by the extra wear and tear in retorts subjected to higher heats and high steaming. It is a fact, I think, that high steaming and low coal throughputs have a very bad effect upon the refractory material forming the retort. In any case, I am of opinion that the saving in maintenance is not large enough to affect the price per therm sold.

In these days of fluctuating prices and receipts, one cannot dogmatize as to the most economical gas to make, and until a larger experience is gained in dealing with therms in existing manufacturing and distributing plant, gas engineers will have to adopt a cautious attitude. New carbonizing schemes are being invented almost daily, and existing methods are being rapidly developed to suit the thermal requirements of the Gas Regulation Act. Indeed, I would not be surprised if, in a few years' time, results something like 30,000 to 40,000 c.ft. of 420 B.Th.U. gas, with a good yield of residuals, are obtained by means of a two-stage process. If this be attainable, it shows the necessity at the present time for going slow with extensions of plant. I should like to say here, for the benefit of those who are working horizontal retorts, and who would be well advised in the interests of economy in reducing the quality of their gas by legitimate means, that there is now a small reliable blue water-gas plant on the market, capable of making from 2000 to 4500 c.ft. per hour, at the remarkably low price of something like £400 or £500; and I shall be glad to give the name of the contractor to any manager interested.

Calorific Value Declarations.

With regard to the declaration of calorific value, an inspection of the figures published suggests that most, if not all, have played for safety. Generally speaking, the values declared have conformed to those being made during the period immediately preceeding the declaration. One can predict, however, with tolerable certainty that in Scotland the bulk of vertical retort undertakings will declare a standard between 400 and 450 B.Th.U. A favourite figure will probably be 425. Where horizontal retorts are in use, managers will probably follow the lead of the South Metropolitan Gas Company; but, if so, they will have to provide special appliances for the efficient utilization of rich gas, just as the famous Company mentioned have had to do. In my experience, the appliances in daily use are quite incapable of giving maximum efficiency with high C.V. gas. The alternative is considerable reduction in quality with a combustible diluent.

The quality of gas we shall supply under the 1920 Act is that which combines best the two qualities of economy in production and efficiency in utilization; and it may be of interest to know that the Town Council, in December last, decided to adopt the Gas Regulation Act at the earliest possible moment. For the past few years the gas supplied to the town of Greenock has been of low calorific value. We try to maintain a local standard of 410 B.Th.U. gross; and I am pleased to say we have no difficulty in keeping within 2½ p.ct. either way—up or down. The gas is tested daily in the most approved and rigorous manner. It is produced in the original type of vertical retorts, and moderate steaming of the charges is resorted to; but, unlike some other so-called "400" gas I have come across, it burns beautifully, and does not miss-fire at a flat-flame burner. To-day I am afraid there are too many calorimeters installed converting gas of (say) 360 into gas of 420 B.Th.U. at the will of the operator; and I am credibly informed that a surprising number of gas engineers rely upon the old-fashioned "durability jet" for British thermal unit guidance. Making and selling gas by the therm will find out the dissembler if he is indifferent to science and careless in practice. Therms are said to be more difficult to collect than cubic feet and candle power. Therefore be wise in time; be scrupulously accurate in the use of laboratory appliances; and let all results be correctly stated when reported. In other words, honesty is the best policy.

In Greenock there are in free use 16,500 cooking appliances and hundreds of private rings, gas-irons, and fires. Likewise numerous furnaces for the heat treatment of metals. But we experience no difficulty in distributing low calorific gas through nearly 70 miles of mains, some of which have been in use since 1849. Neither do we have any difficulty with the burning of this gas in domestic and industrial appliances. Rather do we have less district troubles than formerly. Indeed, my lengthy experience with this quality of gas convinces me that once you have overtaken the readjustment of appliances, and are able to maintain a minimum pressure of 2 in. at the meter inlet, nothing better is required. We consider it our duty to give a first-class public service; and although not legally bound to go beyond the meter, we make it our business to supervise to the point of combustion. Our reward is a contented gas-consuming public. Under the Gas Regulation Act, however, we shall all be obliged from time to time to readjust our views as to the calorific value supplied, as so much depends upon the cost of production. But I may not advise an increase in the present quality, unless it were conclusively proved that a therm of (say) 450 or 550 B.Th.U. gas could be produced cheaper and used as efficiently as a therm of 410 B.Th.U. gross. A point worth noting here is that the efficiency of utilization in existing appliances will appeal more to municipal engineers than to company engineers, because the former are concerned only in providing the best possible all-round communal service, whereas the latter are concerned chiefly in the earning of dividends; and I am of opinion they will not hesitate to declare a higher C.V. if at any time it furthers that object irrespective of the efficiency in use of the higher quality of gas they supply.

Now as regards the relative efficiencies in use of different grades of gas, I cannot do better than refer you to the first, second, and third reports of the Gas Investigation Committee. These reports are veritable mines of information to the seeker after truth; and we cannot do better than dig therein often and deeply. There is one point, however, I should like cleared-up. In the second report, it is stated that the gas used in the burner tests represented a yield of 30,000 c.ft. per ton of coal carbonized, and that such gas was regularly distributed in Uddingston, where the tests were made. This statement is misleading, and should be amplified or withdrawn. The second report informs us that the thermal efficiency of low-grade gas (400 B.Th.U. gross) is the same in ordinary ring burners with suitably aerated flames as that of high-grade gas, and that for high-temperature work, such as incandescent lighting, the efficiency is only slightly lower. Moreover, the thermal efficiency of combustion is much more easily and consistently obtained with gas of lower calorific values. The report states that "In ordinary use the efficiency is probably at least equal in existing appliances, which, it must be remembered, have been evolved to deal with gas of a higher calorific value—pressures below 20-10ths being sufficient to maintain the injector efficiencies necessary for satisfactory working." The inference to be drawn from this is that low calorific gas would be more efficient in every-day use than high calorific gas if it were consumed in appliances specially constructed for its use.

Lighting.

With regard to incandescent lighting, my experience is that low C.V. gas with about 15 p.ct. of CO in its composition gives more brilliant illumination than is possible with high C.V. gas. Moreover, it is a much cleaner and cooler light, and it is perfectly odourless. It was early apparent to me that there was not a burner on the market capable of giving efficient results with gas of about 400 C.V. About a year ago, however, and after many attempts to get burner makers to move in the matter, suitable burners for low C.V. gas began to make their appearance; and now there are a number on the market which give results second to none with gas of from 380 C.V. and upwards.

For quite a long time, and with considerable success, we have been advising consumers to re-nozzle their burners to take medium-sized mantles; and in the past year we have sold many hundreds of first-class burners for domestic use. Medium-sized mantles are advised because the flame of low C.V. gas fills them to advantage, to bursting point in fact, and gives a light equal to a universal size one with high C.V. gas. Flame volume, therefore, is of great importance for successful incandescent lighting. With an adjustment to give maximum lighting effect as we do it in our homes, the consumption per hour with 400 C.V. gas in a modern inverted burner, with a medium-sized mantle, is 3·54 c.ft. at 20-10ths pressure, and 3·77 c.ft. at 23-10ths pressure.

A cluster of three bijou mantles in a setting no larger than an ordinary inverted burner consumes per hour 5 c.ft. of 400 C.V. gas at 20-10ths pressure, as compared with 4·53 c.ft. of 563 C.V. gas in a universal inverted mantle; and the illuminating effect is to the advantage of low C.V. gas—2000 B.Th.U. per hour were required with low C.V. gas and 2551 with high C.V. gas. So that, on a thermal basis, low-grade gas is the more economical in everyday use. Why should gas be supplied which the public cannot utilize efficiently?

Cooking.

The table overleaf gives the comparative efficiency of cooker burners under actual domestic conditions.

It will be noted that in an old-type cooker the efficiency in use with gas of 563 C.V. is 34·66 p.ct., and with 414 C.V. gas it is 40 p.ct. Using a modern cooker, with barless hotplate and new type of burner, the average efficiency is 57 p.ct. with 414 C.V. gas. The average efficiency of a modern type of boiling ring is 63 p.ct. with the same gas. Needless to say, when I made this discovery I decided seriously to consider the replacement of all the burners and bars in our cooking appliances to enable the consumers to obtain the additional 17 p.ct. efficiency provided by the new type of burner and open top hotplate.

Might I draw your attention to tests Nos. 20 and 21, with actual town gas of 484 and 477 C.V. Test No. 20 was conducted on the cooker in a house outside our district of supply, and just as the consumer used it from day to day "until the kettle boiled." The burner tap was left full-on, and the flame came a little bit up the sides of the kettle. The cooker was in excellent order, and installed new only three years ago. At 26-10ths pressure the efficiency was 41·63 p.ct., with an hourly consumption of 22·44 c.ft.; the time taken to boil being 14·12 minutes. Test No. 21, with the tap turned down till the tip of the flame touched the bottom of the kettle, showed an efficiency of 46·08 p.ct., with a consumption of 15·58 c.ft. per hour; the time taken to boil being 18·64 minutes. This test shows that 44 p.ct. more gas was used with the tap full-on than with the tap half-on, and the efficiency

Comparative Efficiencies of Cooker Burners under Average Domestic Conditions.

Test No.	Name of Burner.	Calorific Value.	Cubic Feet per Hour Supplied (Corr.).	B.Th.U. Gross Supplied per Hour.	Efficiency P.Ct. on Gross C.V.	Height in Inches of Kettle Base above Burner.	Pressure. Meter Inlet. 10ths.	Pressure. Nipple. 10ths.	Temp. of Water ° Fahr.	7 lbs. of Water Heated to 212° Fahr. required. B.Th.U. Gross.	C.Ft. Gas. (Corr.).	Time in Minutes.
1.	Old type cooker with straight bars.	404	14·401	5,818	40 55	1⅜	10	9	60°	2624	6·495	27·06
2.	Do.	412	14·690	6,052	41·13	1⅜	12	10	60°	2587	6·280	25·65
3.	Do.	412	16·590	6,835	40·41	1⅜	14	12·5	60°	2633	6·390	23·11
4.	Do.	413	20·242	8,360	39·05	1⅜	20	18	60°	2725	6·599	19·56
5.	Do.	412	25·216	10,389	36·32	1⅜	30	28	60°	2928	7·107	16·91
6.	New type cooker (open sectional top bars).	405	11·395	4,605	58·62	⅜	12	10½	60°	1815	4·482	23·60
7.	Do.	421	11·611	4,888	56·48	⅜	14	12·5	60°	1884	4·474	23·12
8.	Do.	415	14 364	5,961	57·57	⅜	20	18	60°	1848	4·453	18·60
9.	Do.	410	17·659	7,240	55·04	⅜	30	27·5	60°	1933	4·715	16·02
10.	New type boiling ring (A).	404	12·458	5,033	65·84	¼	10	7	60°	1616	4·001	19·27
11.	Do.	417	13·928	5,808	63·64	¼	14	10	60°	1672	4·009	17·27
12.	Do.	411	15·794	6,491	63·45	¼	15	11	60°	1677	4·08	15·50
13.	Do.	420	16·921	7,107	62 85	¼	20	13	60°	1693	4·03	14·29
14.	Do.	420	21·902	9,199	58·62	¼	30	21	60°	1815	4·322	11·84
15.	New type boiling ring (B).	402	13·420	5.395	63·71	¼	12	7	60°	1670	4 154	18·38
16.	Do.	421	13·385	5,635	62·70	¼	14	8	60°	1697	4·031	18·07
17.	Do.	410	15·166	6,218	62·33	¼	15	8·5	60°	1707	4·163	16·47
18.	Do.	419	17·821	7,467	60·73	¼	20	12	60°	1752	4·182	14·08
19.	Do.	421	23·086	9,719	57·86	¼	30	20	60°	1839	4·367	11·35
20.*	Old type cooker with straight bars.	484	22·44	10,861	41·62	1⅜	26	25·5	60°	2556	5·28	14·12
21.	Do.	477	15·58	7,432	46·08	1⅜	27	26·5	60°	2309	4·84	18·64
22.*	Old type cooker, bars in position, tap full on.	563	19·246	10,836	34·66	1⅜	28	26	60°	3070	5·453	17·00
23.	Do. half on	563	10·509	5,917	39·77	1⅜	29	—	60°	2675	4·752	27·13
24.	Do. full on	563	15·630	8,800	36·92	1⅜	20	17·5	60°	2882	5·119	19·65
25.	Do. half on	563	9·470	5,332	42·37	1⅜	20	—	60°	2511	4·460	28·26
26.	Do. full on	563	11·410	6,424	39·79	1⅜	12	10½	60°	2674	4·750	24·98

*Tests Nos. 20 and 21 made on cooker burner which had been adjusted when installed to suit the gas supplied. This accounts for the higher comparative efficiency obtained.

Comparative Efficiencies of Cooker Burners with High Calorific Value Gas.

Test No.	Name of Burner.	Calorific Value.	Cubic Feet per Hour Supplied. (Corr.).	B.Th.U. Gross Supplied per Hour.	Efficiency P.Ct. on Gross C.V.	Height in Inches of Kettle Base above Burner.	Pressure. Meter Inlet 10ths.	Pressure. Nipple. 10ths.	Temp. of Water ° Fahr.	7 lbs. Water Heated to 212° Fahr. required. B.Th.U. Gross.	C.Ft. Gas (Corr.).	Time in Minutes.
27.	New type ring (B)	563	10·806	6,084	63·56	¼	20	—	60°	1674	2·97	16·51
28.	Old type cooker, bars in position.	588	7·07	4,157	37·4	1⅜	5	—	60°	2844·8	4·84	41·07
29.	Do.	588	10·07	5,921	38·5	1⅜	10	—	60°	2762·5	4·70	28·00
30.	Do.	588	12·21	7,179	38·3	1⅜	15	—	60°	2779·3	4·73	23·13
31.	Do.	588	14·43	8,485	35·2	1⅜	20	—	60°	3022·9	5·54	21·37
32.	Do.	588	16·0	9,408	34·6	1⅜	25	—	60°	3078·9	5·24	19·60
33.	Do.	588	17·70	10,408	34·0	1⅜	30	—	60°	3128·2	5·32	18 00
34.	Do.	490	6·91	3,386	30·2	1⅜	5	—	60°	3520·7	7·190	62 25
35.	Do.	490	9·94	4,871	34·7	1⅜	10	—	60°	3068·8	6·26	37 80
36.	Do.	490	12·01	5,885	36·4	1⅜	15	—	60°	2931·6	5 98	29·53
37.	Do.	490	14·28	6,997	36·3	1⅜	20	—	60°	2928·6	5·98	25·08
38.	Do.	490	16·01	7,845	35·4	1⅜	25	—	60°	3003·2	6·13	22·95
39.	Do.	490	17·89	8,766	34·7	1⅜	30	—	60°	3068·8	5·98	21·00

was less by 4·45 p.ct. The kettle, however, took 4·52 minutes less time to boil.

Let me quote one other typical case. An old-type cooker using 563 C.V. gas gave an efficiency of 34·66 p.ct., consuming, with tap full open, 19·246 c.ft. per hour at a district pressure of 28·10ths. With the tap half open and the flame touching the bottom of the kettle, the efficiency was 39·77 p.ct., using 10·508 c.ft. per hour. In this case, 45·4 p.ct. more gas was used with the tap full open than when half open, with a decrease in efficiency of 5·11 p.ct. This state of affairs is, I am afraid, pretty general wherever high C.V. gas is supplied and used without regard to burner adjustment and efficiency in utilization.

An inspection of several cooking appliances in these districts was made with similar results. Now, assuming that the average conditions are only half as bad as these tests prove, it shows, I think, that, in these towns at all events, there would be no increase in volume delivered if the quality of the gas was reduced to 400 C.V.

It is suggested that these wasted B.Th.U. are not only a nuisance to the householder, but a vital cause of excessive gas bills as well. And it is obvious, I think, that as these wasted B.Th.U. have to be made, stored, and driven through mains, services, and meters, their useless presence diminishes the capacity or efficiency of the distributory system to an equal or greater extent than does the delivery of low-grade gas. So that, apart from pecuniary loss to the consumer, it appears that the greater the losses in the use of high C.V. gas, the greater the volume which must pass through the mains, services, and meters to satisfy the voracious appetite of existing appliances. In towns with which I am well acquainted, and where high C.V. gas is supplied, I am strongly of opinion that, owing to the appalling wastefulness in use of high C.V. gas, the distributory system is already doing more work than it would have to do were low C.V. gas supplied.

March with the Times.

The standards of efficiency we are expected to maintain to-day are vastly different from those which prevailed even a decade ago, and, as is the way of the world, the tendency is ever upwards. So if I read the signs of the times correctly, it has never been more necessary to submit ourselves and our processes to self analysis, and to discuss the all-important question of efficiency, than it is to-day. Never, indeed, has there been more need for efficiency—efficiency in the individual, be he leader or worker, as well as in processes—and never, I opine, has there been more well-directed concentration of effort within the industry to attain it. But because of this and other successes, we must not assume that we have reached finality. The new road we have to travel being only partially explored, the forward march will be strenuous and tedious and ever more testing the nearer we approach our goal. But we dare not stand still. To do so would be an admission of failure, and a betrayal of all we held most dear in the past. We have thus no alternative but to march with the times and attune our methods and manners to harmonize with the exacting standards of the moment. Are we, then, as engineers in charge, prepared for eventualities? Are gas authorities—municipal and company—fully cognizant of the industry's needs in the present and future? Do the young men in the profession properly value their great inheritance? Do they realize to the full their own future responsibility? I hope so, because only a wise and liberal policy, supported by highly-trained, well-informed, richly remunerated, scientific men—and gentlemen to boot—will succeed in the fighting days, the high-efficiency days to come. And we shall not be disappointed if all love and honour their profession.

NOTES ON GAS EFFICIENCIES.

By J. Richmond, of Penicuik.

Quality of Gas.

The question all of us have to consider at the present time is whether gas of (say) 400 B.Th.U is as economical to produce and as efficient to use as gas of (say) 500 B.Th.U. I believe this question would not at this time have been prominently before us,

but for the fact that force of war circumstances (which none of us had under our control) necessitated a rapid drop in the quality of gas supplied by all undertakings throughout the kingdom—first by the demand of the Ministry of Munitions that gas should be washed by tar and oils in order to recover ingredients valuable in the manufacture of high explosives, and, secondly, through labour troubles in the coalfields, and at the express injunction of the Board of Trade to economize coal and use water gas as much as possible.

I mention this to remind you that the rapid reduction in quality is in a sense not of our own doing, nor has it come about as a gradual evolution for betterment, but has been precipitated by circumstances beyond our control. These circumstances no longer exist; and it is time now to consider whether a reversion to the older order of things will be beneficial, or if further development will be fostered by a continuation of this reduced quality of gas.

The experience gained with lower grade gas during the war has convinced many engineers that gas of a lower B.Th.U. content per cubic foot than was formerly thought of can be supplied to the consumer with an increase in the efficiency of the service given, and a reduction in the cost thereof. Generally speaking, the advocates of this lower quality are of opinion that 400 to 450 B.Th.U. gas is the most economical quality to supply in the interests of both user and seller. I am perhaps old-fashioned and conservative; but it is my humble belief that the faith of these people is founded on wrong premises, and that in the long run any economies effected by manufacturing low-grade gas are more than off-set by increased expenditure in other directions. It is my opinion that gas of a quality of 500 B.Th.U. will, in the long run, be the best to make and supply in the interests of both supplier and consumer. I am conscious that my arguments in support of my opinion will be found general rather than particular, but opportunities of exact experimental work are naturally limited in a small place like Penicuik. Nevertheless, during the war I had to send out lower quality gas; and it is on the results of my experience that I base my belief that 500 B.Th.U. gas is the most economical. A straight coal gas of 500 B.Th.U. can easily be made from ordinary bituminous coal by the ordinary methods of carbonizing in horizontal, inclined, or vertical retort-settings, and at moderate temperatures.

A 400 B.Th.U. gas is invariably made by using higher temperatures in coal distillation, and augmenting the gaseous product by the addition of carbon monoxide and free hydrogen produced as water gas, either in the coal-retort itself or by independent plant. The advocates of low-grade gas state that it is much more economical to produce. In the initial stages this is the case. Coal-handling and carbonizing wages are less, and the cost of coal is brought down by decreasing the quantity required. Against this we have to set increased fuel consumption in maintaining retort temperatures, and steam-raising for generation of water gas (thus reducing the amount of saleable coke residue per ton of coal carbonized), and the greater wear and tear of plant.

The relative value of bye-products is a considerable factor in the economies of gas production of high or low grade quality. For example, with a good market for coke, it would be better to produce 10,000 c.ft. of good gas with a saleable residue of 10 cwt. of coke per ton of coal carbonized than it would be to produce 20,000 c.ft. per ton of inferior quality with only 5 cwt. of saleable coke. To make a million c.ft. of the former would work out as follows:

100 tons of coal, at 25s. per ton	£125	0	0
Less 50 ,, coke, at 25s. ,,	62	10	0
Net cost of coal	£62	10	0

At 20,000 c.ft. we would require:

50 tons of coal, at 25s. per ton	£62	10	0
Less 12½ ,, coke, at 25s. ,,	15	12	6
Net cost of coal	£46	18	6

The saving in coal in carbonizing at the greater make per ton would thus be only £15 11s. 6d. per million c.ft. of manufacture, or 3·73d. per 1000 c.ft. Against this 3·73d. saving we have greater wear and tear of plant and a production of a quality of gas of about 20 p.ct. less value in thermal efficiency, volume for volume compared with the water gas. I have taken these calculations as a fair average of present-day prices, but each of us can calculate the relative costs, based on local demand and prices for residuals.

On this question of production per ton of coal I have examined the working results of a number of undertakings, and find that works producing straight coal gas of over 500 B.Th.U. per cubic foot in very efficiently operated horizontal retorts show yields of from 64 to 70 therms per ton of coal. Few of the vertical plants with steaming, or works mixing coal gas and water gas, show above 75 therms; and a comparison of the cost per therm reveals that one has to go to the third decimal place to find the advantage in favour of the latter. It would appear that actual manufacture of low-grade gas by means of augmenting the make per ton may not be beneficial even to the supplier. The economies in carbonizing may be more than negatived by increased purification costs, due to excess of sulphur compounds produced by high temperatures.

Wear and Tear of Plant.

Now we come to a different aspect of the cost of manufacture, and one which does not make itself so immediately felt. It is the wear and tear of plant, which will no doubt increase in years to come if the lower quality of gas is continued. Taking first the retort-settings themselves, on account of higher temperatures the deterioration is greater and renewal expenditure increased. The fact that the life of refractory materials has come in for scientific investigation on behalf of gas undertakings would indicate that this item alone is perturbing the minds of many gas engineers. The renewal of a retort-setting may cost anything up to £20 per mouthpiece; and if this piece of our plant is worn out earlier than heretofore, it tends to reduce the economies of manufacture.

As already mentioned, we have also increased cost of purification, and owing to the presence of CO_2 in greater quantities in the lower quality of gas we may require, in addition to the increased number of purifier changes, a reversion to at least part purification by lime to take up the CO_2. The net increase in purification costs is difficult to determine. Where it has been observed, it is often ascribed to the deterioration of the purifying material, rather than face the plain fact that lower grade gas in its crude state contains more impurities.

There are other portions of our plant which are at present showing greater wear and tear. Appliances of cast iron are very little affected by corrosive influences, but wrought iron and steel are particularly liable to such influences. As a consequence, there are the working parts of station meters, governor bells, covers of purifiers, and the interior of gasholder sheeting. Compare the interior of a gasholder of to-day which has for a number of years stored lower grade gas and that of the gasholder where high-grade gas has always been stored, and what do we find? A vast amount of oxidation and corrosion on the former and a beautiful new skin on the other. Now beyond external attention, a gasholder is not a part of our plant that can be annually provided for in combating depreciation, so that the moth of destruction, in this case, cannot be computed in terms of so much per 1000 c.ft. or so much per therm, for probably some years to come; but it is there.

Distribution—Renewals and Upkeep.

In distribution we come to something easier to calculate; but even there we are just on the fringe of possible defects. Wrought-iron services are costing more for renewals and upkeep; and in the case of meters, with their more delicate parts, the cost of maintenance has gone up very considerably. In one works, taking the average of three years (1919 to 1921) compared with the average of three years preceding 1914, the cost of meter repairs shows an increase of 270 p.ct. Assuming that makers' prices of repairs are double what they were formerly, this would still show fully 150 p.ct. increase in meter repairs, due allowance being given for additional meters in use.

The lack of the heavier carburetted hydrogen gases in the lower quality supplied is conducive to the contraction and drying-up of meter diaphragms, gritty deposits on valve surfaces, causing defective registration and shortening the life of these appliances; and on account of the fact that consumers require more gas for a given purpose with the lower quality, meters are often taxed beyond their normal capacity.

We have all more or less experienced this increase in meter repairs, and manufacturers are considering whether they can continue the present guarantee on these appliances, which, if withdrawn or modified, will further increase the cost of meter repairs to gas undertakings.

Conclusion.

These, gentlemen, are a few of the defects from the manufacturing and distribution side of low-grade gas; and I am inclined to assert that they are sufficient to neutralize the economies in manufacture, which are paltry if expressed in terms of per 1000 c.ft., and which I believe are the cause of the failure to give adequate reduction in price to consumers commensurate with the reduction in quality and increased quantity required.

The manufacturing savings being dissipated by the extra expenditure on fuel costs, plant maintenance, distribution, life of services and meter supervision, the sentimental side of the question is often argued in favour of low-grade gas production—that is, the statement that by giving this quality we are conserving the national asset of our coal resources. But we, as practical men, cannot run our establishments on sentiment. We have got to be practical; and, after all, the conservation of coal by increased gaseous production per ton is highly illusory. One form of carbonization is much about the same as another in thermal efficiency; and low-temperature carbonization enthusiasts argue that the best means of coal conservation is in retaining the therms in the solid and liquid residues and not in the gas, which argument seems equally justified by the fact that though many of us went to considerable trouble and expense to cater for gas traction when petrol was scarce, still, now that petrol is obtainable, the motor industry prefer to get their therms in the liquid rather than in the gaseous form.

The Consumers' Point of View.

Having considered the subject from the presumed economies of manufacture, we now come to the point of view of the consumer. The most ardent advocates of low-grade gas admit that more is required for a given purpose than with the higher grade gas. Four cubic feet of 500 B.Th.U. gas contain an equal number of heat units to 5 c.ft. of 400 B.Th.U.; so that, to all intents and purposes, the gas of 500 B.Th.U. is 25 p.ct. better value. This is borne-out in practice by the simple fact that the

richer gas, when used in the ordinary bunsen burner, requires more aspirated air to complete combustion than the poorer quality of gas, thereby giving the consumer a much greater volume of serviceable combustible gas; the rates working-out to about the percentage named.

The fact that greater quantities of gas require to be used necessitates in many cases either enlarged mains, services, meters, and internal piping, or increased pressure through existing pipes causing increased leakage, which may not be shown on a relative percentage basis, but which is there in volume. Where these necessary augmentations are not carried out, there are endless complaints from consumers as to defective supply, which cannot be ignored. I take it that the additional cost of district superintendence, attending to consumers' complaints *gratis*, interviewing them on their premises, explaining about burner regulation, broaching-out orifices of cooker boiling rings, &c., is a further considerable item to set against the economies of manufacture.

It is quite a common complaint by consumers of the lower grade gas in towns and cities that they cannot get their kettles of water to boil in the same time as formerly; and no amount of scientific explanation that the gas contains a certain number of heat units will convince them that it is not the quality of gas which is at fault. In addition to the time lost in boiling the water, it is very irritating for consumers to find their gas bills have also increased.

Good service to consumers is of prime consideration to continued financial success and the future prosperity of the industry. The South Metropolitan Gas Company continue to supply a straight coal gas of 550 B.Th.U., and the Gas Light and Coke Company, after a short experience with gas of a lower quality, are now raising their standard to 500 B.Th.U., as also Plymouth, Derby, and other representative concerns. It must be conceded that these are most progressive undertakings which cater for all-round efficiency, both from the point of view of a satisfied clientèle and economical manufacture.

It may be possible that in certain circumstances gas of a lower quality than 500 B.Th.U. will give equal service; but these special circumstances and conditions are not readily obtained. I am certain that, unless a reduction of price be given to consumers commensurate with the extra volume required to be used, the advocates of low-grade gas have no legs to stand on; and in my opinion it is not clear that the price at which lower grade gas is sold is less in proportion than higher value gas, showing that gains in one direction are lost in another.

THE DISCUSSION.

The PRESIDENT said he had read the two papers over with a considerable measure of interest; and the thought which struck him was that both writers, either consciously or unconsciously, had dealt with a consumer's point of view. Mr. Keillor, whose paper was a plea for low-grade gas, was the Engineer of a gas undertaking in a busy Clydeside shipbuilding community. In Greenock, no doubt large volumes of gas were required for industrial purposes; but at the same time the housewife claimed an amount of gas of a certain value for her own domestic purposes. It followed, then, that Mr. Keillor had to consider the interests of two sets of consumers—one claiming domestic gas and the other calling for power gas. It was well to keep in mind the fact that in these days, and particularly since the war, all gas supplied was power gas. This led the author on to a line to meet, if he could, both needs with the one quality of gas. They would agree with him in saying that Mr. Keillor had succeeded in doing so. He had given a gas suitable to an industrial centre like Greenock and to other centres similarly circumstanced industrially—such as Glasgow, Manchester, Leeds, and Birmingham. Not only had Mr. Keillor supplied a standard gas for industrial purposes, but he was in a position to give something that satisfied the ordinary housewife, than whom there was no keener critic or careful user in respect of gas. Mr. Richmond, on the other hand, was Manager of a different type of place. Penicuik was an inland town where it might probably be said that the domestic consumer preponderated. In all likelihood there would be a demand in that centre for a gas with a quick heating value. It would be recalled that the old gas which was supplied ten or fifteen years ago was a rich, yellow illuminant. Nowadays, with the trend of later development in the manufacture of gas, the yellowness did not matter quite so much; but heating value was still demanded. Penicuik, then, would stand for a domestic gas giving quick results; and doubtless the plant which had been installed at the gas-works there had been adapted more for the provision of a richer gas than was the case with the larger plant at Greenock, where low-grade or high-grade gas could be produced at will. A great deal depended on the plant that the engineer had at his disposal; and one development of the position was this—that in a large works with the bigger type of plant it was easy and convenient to supply a low-grade gas, whereas in smaller works the plant at the disposal of the engineer was such that it was more convenient, in the majority of instances, to supply higher grade gas. On the question of calorific value, it seemed to him that what the consumers asked for in the different types of towns consciously or unconsciously influenced managers in deciding to manufacture high or low grade gas.

Mr. J. W. M'LUSKY (Glasgow) said that he likewise represented what might be called a Clydeside community. Having had no opportunity of previously perusing or studying the papers, it was a little difficult right offhand to offer anything in the way of what might be called constructive criticism—indeed, it seemed to him that one effective way of stopping criticism was to invite a discussion on papers which one had only just heard read. At the same time, he was bound to acknowledge that Mr. Keillor's paper at once impressed them with the amount of thoroughness and preparation that had been put into it. It was quite apparent that the author was a believer in the axiom that what was worth doing was worth doing well. The paper was one that would be referred to by the members after they had left the meeting, and when they had the leisure to look as closely into it as it deserved. It did seem to him, however, that Mr. Keillor had started off on his paper when certain things were rankling red-hot in his mind. There was no doubt that the author, to begin with, had dipped his pen in the ink of irritation. Obviously, he had been quite irritated when he wrote the first part of the paper; but he settled down like the good philosopher he was, and gave them the very best of advice. The question of thermal efficiency undoubtedly depended on what plant a man had under his control, and the kind of distribution system he was dealing with. He (Mr. M'Lusky) made this statement two years ago; he made it a year ago; and he wished to repeat it once more. More particularly as to the question of low-grade gas or high-grade gas, he would say that it was all a matter of thermal efficiency in the works, on the balance-sheet, and a satisfactory service to the community for which one was responsible. The position really amounted to this—that Mr. Keillor might be right in doing as he was in Greenock, and Mr. Richmond might also be quite right in following the course he was pursuing in Penicuik. It was rather instructive to turn for a moment to gas analyses as disclosed by some of the works. If they took England, for instance, where there was better competition than in Scotland, he would mention Keighley, Widnes, and Bath as three towns providing good examples of horizontal working, and whose results were worthy of close study. In the gas-works of these three towns, the results were really striking when viewed from the standpoint of thermal efficiency and balance-sheet efficiency. If he were asked to suggest a good quality of gas in a vertical plant, he would say something between 425 and 450 B.Th.U. if the distribution system could be guaranteed to deliver the gas. If there was a poorer distribution, then he would say 475. Where there was a mixed plant—horizontals and verticals—something in the region of 470 or 500 would be sufficient; but if the plant was purely a horizontal one, the standard ought to be between 500 and 550. Straight horizontal gas with a legitimate dilution of blue water gas—the latter steadily mixed—might prove the best. In certain circumstances, engineers found themselves in charge of a plant that was working at its very limit in order to supply the demand. Where this was the case, then successive steaming, with its lowering effect of throughput, might prove too embarrassing. Indeed, by comparison, a medium steaming for an increased throughput would meet the situation and the demand much more successfully. Whether the standard was 400, or any grade up to 550 B.Th.U., there must be a satisfactory system of maintenance in regard to fittings. Mr. Keillor had urged the point that even a 500 or a 600 B.Th.U. standard could be improperly used. He agreed with this remark. Touching upon the value to be derived from having consumers visited regularly by maintenance men, Mr. M'Lusky explained that the Glasgow Corporation, as an experiment, were soon to inaugurate a maintenance scheme. The area selected for the experiment was Bridgeton, or the eastern district of Glasgow. In his own mind, he was absolutely satisfied that one penny per 1000 c.ft. would be found sufficient to maintain the fittings. An expenditure of this nature would in the end prove a gain by the reduction in the number of complaints. After all, there was a trained official or accountant who could assess in pounds, shillings, and pence the real value of a satisfied community.

Mr. DAVID VASS (Perth) considered the quality of gas they would have first to face was just that quality which the consumer had been in the habit of using in pre-war times. Personally, he was a believer in the idea of a systematic inspection of fittings. This was a scheme that ought to be undertaken by every community. Of course, here and there they did happen across the short-sighted economical councillor who looked upon a scheme for the inspection of fittings as throwing away money. Very often it was difficult to bring forward certain financial support for such a scheme. They could not say, for instance, that a regular supervision of fittings meant a saving of so much in pounds, shillings, and pence; but while this was so, he himself was satisfied in his own mind that it paid, and that it did eventually affect the balance-sheet. In his town they were supplying a quality that came in about 475 B.Th.U.; and it was satisfying the consumers. During the war, however, they had to go down much lower than this standard; and, of course, they did have complaints then from a certain industry. The interests of these industries had to be considered; and they had to make up their minds whether it was more economical in the long run to produce the 475 standard or the 425 B.Th.U. grade. If it was found, for instance, that the 425 B.Th.U. grade could be produced more cheaply, and the apparatus used by the various industries could be so manipulated as to work with gas of that standard, then it certainly would be fair economy to introduce it. It might be cheaper one year to make 425 B.Th.U. gas. This might apply for a matter of two years; but in the third year, owing to the altered state of the market, the 475 B.Th.U. standard might prove the more advantageous. It was quite true that they could not go up and down repeatedly in their adjustment of fittings. They had to take a long view, and try as best they could to average the results over a period of years. Proceeding cautiously along this line, they should endeavour to hit upon what was going to be the most economical standard in the long run.

Mr. LAURENCE HISLOP (Uddingston) remarked that it was rather unfair to ask members to criticize a paper such as this immediately after the contribution had been read or heard for the first time. It would have been an act of courtesy on Mr. Keillor's part, if he proposed alluding to certain statements made in 1919 and to the work that was done by the Gas Investigation Committee at Uddingston, if he had sent him (Mr. Hislop) an advance copy of the paper. He was led to believe that some members of the Association had been so favoured by Mr. Keillor. Certainly if he had the paper earlier he would have been much better able to reply to the author's criticism than he was at the moment. It seemed to him that it would be quite a good arrangement if they could have the discussion resumed at the annual meeting of the Association in September, when Mr. Fairweather would again be presiding.

The PRESIDENT observed that there might not be time at the annual meeting for a resumption of the discussion; but the suggestion was

one that would doubtless be kept in view by the Council. At the same time, it would be better if Mr. Hislop would make whatever comment he could on the papers at the present stage.

Mr. HISLOP said he thought Mr. M'Lusky had put it very well when he remarked that Mr. Keillor had evidently been labouring under a great amount of irritation when he wrote the first three-fourths of the paper. The author, it would be noted, referred to the sensational announcement which was made in 1919; but if his (Mr. Hislop's) memory did not fail him, there was an analysis of the gas given on that occasion. The actual calorific value of the gas was 378 B.Th.U., or approximately 400 B.Th.U., which was the real figure given. What was done at that time with the gas of that standard could be repeated to-day if financial conditions were taken into account. Unfortunately, however, the present markets for coal and various other residuals did not make the manufacture of gas of that standard an economical proposition. It would be noticed that the author in the course of his paper dealt with Test No. 5 of the Gas Investigation Committee's series of tests. If the author was going so carefully into the matter, then surely he ought to have taken into consideration the tests which were carried out by Sir George Beilby at the Fuel Research Station at East Greenwich. The figures which were obtained there very nearly bore out those stated in 1919. Then it had to be kept in mind that certain tests at Uddingston which were carried out by the Gas Investigation Committee were not reported, because they did not happen altogether to balance in some directions. It seemed to him, then, that if Mr. Keillor had had all the information available in front of him, he might possibly have been a little more considerate in his criticisms. In regard to the paper generally, it was a very fine production. Undoubtedly it did demonstrate in a very apt way the efficiency of low-grade gas. From his own experience at Uddingston, he would say that it was all a matter of finding out to begin with what gas one could produce most economically on the therm basis, and in such a way as would apply to the consumers' burners and appliances and give to them the best value for the money paid. Certainly the distribution mains had to be taken into account; and a very serious factor in the question was the local market for residuals. If everyone at the moment was to go back to the old-fashioned horizontals, and make (as Mr. Richmond was doing) 10 or 12 cwt. of coke per ton of coal carbonized, there would be so much coke available that its value would be nothing compared with what it was to-day. In point of fact, enormous stocks of coke would be practically indisposable. Those who were utilizing a proportion of that coke by steaming, &c., could give as good a service to their consumers as could be done by a so-called high-grade gas of 500 B.Th.U. He had always been under the impression that a high-grade gas was a standard of (say) 560 or 600 B.Th.U. Mr. Richmond, however, laid down the new rule of 500 B.Th.U. It seemed to him that if Mr. Richmond had a little experience of a larger plant and the distribution of a lower grade gas, he might find that the 400 B.Th.U. standard was a high-grade gas.

Dr. E. W. SMITH (London) said it was not very easy to criticize a paper just after hearing it read and without opportunity being afforded for a longer study of the points made and the conclusions reached by the author. One felt, however, after listening to both papers, that one could agree with the bulk of the facts that were stated. There was nothing really combative at all in the actual facts the authors had placed before them, nor was there anything combative in the deductions to be drawn from these facts. It did not seem at the outset of his paper that Mr. Keillor intended making his deductions so definitely as he did at the end of his contribution. It would be noticed that Mr. Richmond suggested that a 500 B.Th.U. standard was the right thing for a high-grade gas. On that point, he would like to remark that in England a 500 B.Th.U. standard was not looked upon as a high-grade gas. In England, 600 B.Th.U. was the pre-war standard of such a gas. He supposed that the difference in the coals used in England as compared with Scotland would be equivalent to 50 B.Th.U. at least; so that a 500 B.Th.U. standard in Scotland would be equal to 550 in England, which was approximately the standard of gas supplied by the South Metropolitan Gas Company. Mr. M'Lusky had hit the nail on the head when he made the observation that every gas engineer would have to settle this question for himself. It certainly did seem to him that there were a few factors which must be borne in mind by every gas engineer before he contemplated making any radical changes. In the first place, he thought Mr. Keillor had convinced them, as Mr. George Helps had previously done, that for domestic uses—for lighting particularly—they could get 5 p.ct. more efficiency with a lower-grade gas than with the 550 B.Th.U. grade. In his paper, Mr Keillor had given them a lot of figures on the efficiency of gas-cookers. On that aspect of the question he always felt that if they were going to any expense in altering the cookers to suit one gas there was just as much reason for making the same alterations to suit another standard of gas. Under normal conditions, with a 500 B.Th.U. gas, it was cheaper to alter the jet on the cooker burners, so that the normal pressures were higher than they used to be. Inattention to this detail explained why so much gas was lost. If they did make low-grade gas, it was going to cost more for any loss in the way of distribution. It was also going to cost a great deal more to handle it in the works; and if residuals were to be of any value in the future, apart from coke, the efficiency of extraction must be adjusted in a manner corresponding almost to the reduction in the quality of the gas. Take cyanide extraction, for example. It was the normal thing to leave in the gas half a pound of cyanide per 10,000 c.ft. The cyanide, however, would require to be diluted for the increased quantity, and still have in the gas half a pound per 10,000 c.ft. Then of the planning and designing of the works notice must be taken if it was proposed to deal with an increased volume. Gas engineers in the past, in designing their works, had allowed very big margins for future eventualities in the way of extension. What it amounted to was this (as also Mr. Keillor pointed out)—concerns with low-grade gas were living on the capital of their insurances. They had not as yet felt that drawback, because they still had the margin up their sleeves, so to speak. Very soon, however, they would have to review the whole situation. There was no doubt that the gas industry was progressive—indeed, he supposed in a very few years' time it would be considered the proper policy to take out the whole of the sulphur in gas if the latter was to be used for lighting purposes. If sulphur was to be taken out, then this question of dilution became very important. They had been a bit deluded in their consideration of this question by the effect of the experience acquired during the war. Frankly, he submitted that all their war-time experience should now be forgotten. There ought to be no question of bringing in war experience so far as over-pulling was concerned. It came down to the question of not what was the most efficient gas to make, but what was the cheapest gas to manufacture. He submitted that a little too much had been said during the past four years on the question of efficiency and too little in regard to the cost of production of therms. In investigating this subject, they were not to accept what Mr. Keillor urged as the pattern for one minute; nor should they take what Mr. Richmond said as the pattern for one minute. The best and most effective way was to examine things themselves. Each individual had to take fully into account local circumstances. If they did so, they would arrive at the conclusion that the quality of gas they produced would be the cheapest gas, because all qualities of gas could be used efficiently if they adjusted the appliances to suit.

Mr. JOHN M. SMITH (Stirling) said he only wanted to touch on the gas regulation part of Mr. Keillor's paper. In Stirling they declared the quality of the gas at 475 B.Th.U. This was the value they could definitely supply, and the value he could conveniently dispose of; and the results were to be found demonstrated in the balance-sheet of the Stirling Gas-Works to-day. They had been supplying this grade of gas for twelve months, with satisfaction to all concerned. In the course of his paper, the remark was made by Mr. Keillor that a 360 B.Th.U. grade of gas could be easily converted into a 420 B.Th.U. standard by different methods of testing and by different people making these tests. Why should different methods of testing bring the standard from 360 to 420? The trouble was that the tests were not dependable, because no regular tests were made, and because works had not been operating on the therm basis and could call the gas anything they liked. In Stirling, they were now selling by the therm; and it made them test the gas with efficiency and thoroughness. They did not get any additional payment when they sold gas over 475 B.Th.U. Accordingly, it became incumbent on them to make certain that the gas was tested with the best apparatus at their disposal. It had been observed by Mr. Keillor that charging by the therm gave more benefit to the buyer than to the seller. Possibly this was the case; but the benefit was so little that he did not think it was worth much consideration. The buyer was certainly getting a little more than he was paying; but, on the other hand, the gas undertaking had to supply him with a specified standard of British thermal units—he must get that. Under such an arrangement the advantages to buyer and seller were mutual; and, as a previous speaker had said, the value of a contented consumer could not be measured in pounds, shillings, and pence. Then there was the point which had been urged that gas companies were concerned less with efficiency than with dividends. A remark of this kind touched him on a tender spot. He disagreed with Mr. Keillor when he made this statement, because his experience had gone to show that it was only by efficiency that gas companies could expect to get dividends. Speaking for his own particular Company, he could assure the members that efficiency was not sacrificed for dividends.

Mr. GEORGE KEILLOR, in replying to the points raised in the course of the discussion, said he would like to say a great deal more yet on this subject. He had the feeling that more matters might have been raised in the course of the discussion. Nevertheless, he was quite pleased that the paper had evoked such a spirited discussion; but he felt there was not much time at the present meeting to cover all the ground. His intention was, if the suggestion proved acceptable to the members, to reply in writing to the discussion. He was sorry that it had not been possible to let Mr. M'Lusky and Mr. Hislop have copies of his paper in advance. The former gentleman ought to have had his copy on the previous day; and it was certainly posted so as to reach him at that time. Mr. Hislop had been inadvertently missed out; and he regretted this very much—it was not at all intentional.

Mr. BRAIDWOOD (Coatbridge) asked, if a written reply was to come from Mr. Keillor, could not other members of the Association send in written contributions to the discussion as well?

The PRESIDENT thought the more satisfactory form of criticism was to have it upstanding by word of mouth, rather than in the written form. The Council might wish to act on the suggestion made by Mr. Hislop, and find half-an-hour or so for a resumption of the discussion at the annual meeting in September. Perhaps the discussion could be resumed in this way, and Messrs. Keillor and Richmond could reply to the debate that had so far taken place that day?

Mr. J. RICHMOND (Penicuik) said he would like also to pay his tribute to the paper they had heard from Mr. Keillor. He regarded it as a standard work. In regard to the relative efficiencies, he was sure it would have been noticed in the past that the claims on behalf of low-grade gas always emanated from someone or another with an axe to grind, or a type of plant to sell. Mr. Keillor, on the other hand, had approached the subject in a very unbiassed way. He had provided them with a paper that was well worthy of consideration; and he was sure it would be properly studied by the members when they settled down in leisure moments to examine it. He did not feel at all crushed by the criticism his own paper had evoked—indeed, he had been prepared for something very much worse than he had received. He was old-fashioned, he admitted; but he was bound to state his own feeling that low-grade gas had been practically forced on the profession. If Mr. Keillor was in the right, then he hoped the members of the industry would act unitedly on the lines he had indicated. His paper was a masterpiece, and it gave him (Mr. Richmond) particular pleasure to pay his personal tribute of appreciation to its distinctive merit.

The discussion was then closed, with the passing of votes of thanks to the authors.

The Leeds Corporation have decided to apply for sanction for various borrowing powers, including £50,000 required for gas-stoves, during the two years ending March 31, 1924.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Twenty-First Annual Meeting of the Association was held last Saturday at the Grosvenor Hotel, Manchester. Mr. J. Bridge (Senior Vice-President) occupied the chair, in the absence of the President (Mr. J. B. Stewart), who had undergone an operation, and was still in hospital.

Annual Report.

The Hon. Secretary (Mr. J. Alsop) presented the annual report of the Council; and it was adopted. The report stated that on April 9, 1921, the number of members was 181. Since then 26 had been enrolled, 4 had resigned, there had been 2 deaths, 4 had ceased to be members by Rule IV., one had left the country, and 2 had been transferred to other Associations, leaving the membership at 194—being an increase of 13. The prize of £2 2s., which was offered by Mr. J. Berry (Oldham) for the best paper read before the Association, had been awarded by the Council to Mr. J. H. Clegg, of Burnley. The statement of accounts up to date showed a credit balance of £36 14s. (the year does not close until September).

Election of Officers.

Messrs. H. Butterworth and E. Hardiker were appointed Scrutineers.

While the ballot papers were being counted, the Chairman announced that there had been no other nominations for the positions of Hon. Secretary and Hon. Treasurer, further than their present officers, so that he had pleasure in declaring Mr. J. Alsop as Hon. Secretary, Mr. J. Robinson as Hon. Treasurer.

The ballot papers showed the following elections:

Junior Vice-President.—Mr. J. H. Clegg.

Council.—Messrs. F. B. Small (Liverpool), J. T. Haynes, Assoc. M.Inst.C.E. (Bolton), W. L. Heald (Preston), H. C. Applebee (Manchester), and J. Albinson, B.Sc. (Manchester).

Auditor.—Mr. F. Dean (Altrincham).

Mr. J. T. Haynes moved a hearty vote of thanks to the Council for their work during the past session.

Presentation to Mr. J. H. Clegg, of Burnley.

Mr. J. Berry, at the call of the chair, presented the book prize (selected by the recipient). In a neat speech, he congratulated Mr. Clegg, and said he hoped that next year there would be a good response to their officers' call for papers. Personally, he was in favour of short papers, and ones that had a tendency to promote discussion, and dealing particularly with difficulties met with and overcome.

Mr. Clegg thanked Mr. Berry, and said that he should value the prize very highly.

The Chairman announced that Mr. Berry was continuing his offer for next year.

The following were the guests of the evening: Messrs. T. Duxbury (Oldham), Wm. Rogerson (Hon. Secretary of the Manchester District Institution of Gas Engineers), P. M'Nab (President of the Yorkshire Junior Association), F. A. C. Pykett (Hon. Secretary of the Yorkshire Junior Association), W. H. Locke (General Gas Appliances, Ltd.), E. West (West's Gas Improvement Company, Ltd.), W. Buckley (Representative from the Manchester Institution of Gas Engineers).

After tea there was the annual social. The usual toasts were duly honoured; and the songs and other items of the programme were all contributed by members of the Association.

Calorific Standards in the United States.

At their annual meeting last year, the Southern Gas Association of the United States appointed a Committee to report upon the question of calorific standards; and this Committee have now drafted a resolution, with the suggestion that it be placed upon the minutes of the next meeting. The resolution points out that the widely divergent conditions existing in different sections of the country as to the availability of raw materials used in gas manufacture, have strongly united the consensus of opinion of those devoted to the scientific and economical development of the gas industry that freedom from restrictive standards of gas quality are absolutely indispensable to the relief of the industry and the public as well. For the candle power standard should be substituted a heating standard sufficiently flexible to meet the conditions governing the availability of raw materials in any quantity found necessary primarily to effect the conservation of the nation's coal and oil resources, to the furnishing of the best service to the consumer at lowest cost, and finally to the economical development of the gas industry. Attention is called to the results of investigation and research of the Committee on Calorific Standards of the American Gas Association and others in authority, which are so convincing—that no universal heating standard should be adopted, but that the industry should be free in different sections of the country to select within comparatively wide limits that standard which best lends itself to the most economical utilization of the raw materals available, and at the same time insures the best possible service to the consuming public. Such a range the Southern Association Committee recommend should extend from about 425 to 525 B.Th.U.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Works of the Volker Lighting Corporation.

There was a large turn-out of members last Friday afternoon, on the occasion of an inspection of the works in Garratt Lane, Wandsworth, S.W., of the Volker Lighting Corporation—a constituent Company of Lighting Trades, Ltd. Assembling at the main entrance, the visitors found a warm welcome awaiting them at the hands of the representatives of the Company, who included the following gentlemen: Mr. C. S. Garland, A.R.C.S., B.Sc., F.I.C. (Managing-Director, Lighting Trades, Ltd.), Mr. A. T. Metcalfe (Manager, Lighting Trades), Mr. F. A. Greene (Consulting Engineer), Mr. T. W. Langler (Works Manager), Mr. W. Colle (Works Chemist), Mr. T. N. Clark (Chemist), Mr. W. G. Mason (Accountant), Mr. A. Matthews (Engineer), Mr. W. Bradley (Representative, South-Eastern Counties), Mr. A. E. Saddington (Representative, South Coast), Mr. H. Readshaw (Representative), Mr. W. J. Marrables (Advertising Manager). Mr. T. D. Asten (Director, Lighting Trades) had also arranged to join the party.

The works are on an extensive scale, covering, as they do, an area of nearly three acres; and as every process was freely thrown open to the visitors, the couple of hours or so allotted to the tour proved none too much. The inspection commenced in the knitting-room, where a range of machines were knitting ramie yarn with various stitches, according to the quality and type of mantle required. It was pointed out that a total of approximately 389,000 miles of yarn is used in this room in a year. This would be sufficient to go round the world about fourteen times. Installed also in this room is an ingenious machine for cutting the fabric into required lengths for either upright or inverted mantles. The same machine packs the bundles neatly, and therefore allows of easy counting.

From the knitting-room, the visitors passed to the washing-house, where they were struck by the extreme thoroughness with which the operation of washing is performed, by the aid of boilers, earthenware tanks, and a distilled water installation. The fabric as received contains impurities; and to remove these, it is washed in acid, which itself is removed by dipping in a solution of ammonia. After washing, the material is hung over rails and dried in specially heated rooms; care being taken that the temperature shall not in any way be detrimental to the fabric. On the way to the drying-room, there was seen the photometer; both "Flicker" and Bunsen disc being used, according to the colour of the light to be tested against a standard Harcourt pentane lamp. Near-by is a store containing bundles of knitted material for every description of mantle.

The upright sewing-rooms were next visited; and here one saw nimble-fingered girls sewing (with a dexterity which caused much comment) tulle to the part of the mantle which would eventually form the head. Nearly 15 miles of mosquito netting, 9 ft. wide, is used annually in this process. The dipping of the mantle lengths into the solution of thorium and other nitrates was witnessed. After this process, the impregnated lengths are run through a machine with adjustable rollers, which allows the fabric to retain just the right quantity of solution required. It was pointed out here that equality in impregnation is of great importance in the making of mantles, which will be of good shape in a finished state. In the same room were girls handling a fixing solution, consisting of aluminium and other nitrates, to give further strength to the head. Row upon row of glass shapes met the eye in the next room; and the warmth of the atmosphere was sufficient evidence that the visitors had entered another drying room.

In the following room, the upright mantles were being sewn, and the heads pleated. With the aid of another machine, the asbestos thread loop is made; and then the fabric is all ready for burning-off and seasoning. The fixing of rings to inverted mantles was witnessed; while in the same room the bottoms of these mantles were being sewn, after which the name is branded on by small stamping machines. On the way the workers' cloakroom had been passed—and empty it looked. Pegs are provided for 800 workers, whereas not more than 300 were occupied during the visit; and this has been the state for a long while.

A large gas-compressor, and a holder close by, were noticed on the way to the inverted mantle room; and from this plant comes the supply of gas used during the process then reached—the burning-off and shaping. For power, lighting, and manufacture of mantles, approximately 9 million c.ft. of gas is used annually; and with the works fully employed, this amount would, of course, be considerably increased. Despite the fact that heat and smoke from the burning-off machines are rising continuously, it was observed that the presence of fumes was hard to detect; the atmosphere seeming quite cool. This is due entirely to the fact that centrifugal fans draw the hot air down through gratings and along pipes under the floor, and then out of the building by means of large ventilators. The mantles are suspended from trays for the burning-off process, which is done by means of mechanically operated gas jets. After the upright mantles have cooled, they are placed on the seasoning machine, where the fragile texture is shaped by means of high-pressure gas-burners which rise and fall at the will of the operator. In a similar manner the inverted mantles are seasoned; but in this case the gas is applied downwards through the ring. The mantles are

next passed through traps in the wall into the collodionizing room, to receive the coating which allows of their being transported. An ingenious precaution against fire is provided here, as only one side of these traps can be opened at one time.

Trimming and cutting the bottoms of upright mantles were seen; and this completed the tour as far as the actual manufacture was concerned. But there yet remained to be seen girls thoroughly examining and testing the mantles. Every mantle is individually tested for size and shape; and any with the slightest defect are rejected. A little way off the stitching machines were making ready the boxes to receive the mantles. In normal times, a large number of these boxes are used; and the visitors were given to understand that, when piled on end, a year's supply would reach 500 miles high.

The members were next afforded an opportunity of viewing the large and well-equipped laboratory, where a shocking-machine was registering shocks by the thousand in its endeavour to get the better of the mantle affixed thereto, and where another machine was testing the strength of the ramie yarn used in manufacture. Close by is the fitter's shop, where quite a number of fitters were employed repairing the machinery used in manufacture. A walk through the stock-rooms proved that the Volker Lighting Corporation can supply any kind of mantle at no matter how short notice. Boxes neatly stacked are there; and each compartment is kept clean by the aid of curtains pulled across the front. Those who took part in the inspection were thoroughly convinced that the Corporation leave nothing undone to maintain the quality of their mantles at the highest possible level.

The tour concluded, the various parties met again; and, a photographic group having been taken, to the number of nearly one hundred, they sat down to tea in the new messroom attached to the works. Afterwards,

The PRESIDENT (Mr. Frederick A. Frost) said the Association were very much indebted to the Volker Lighting Corporation for having so readily accorded them facilities to visit the works. The attendance in itself showed how greatly these facilities were appreciated. In going round the works, one could not fail to be impressed with the first-class, highly efficient organization to be seen on all hands. Especially was one impressed by the self-contained character of the works. Apart from the business of making mantles, there were many other industrial processes being undertaken in order to render the concern independent of outside influences. When it was considered that the incandescent mantle business had its origin in Germany, it was greatly to the credit of these English companies that they had been able to establish the business in this country, and place it on such an excellent foundation. The importance to the country of possessing an industry of this character was manifested during the tragic years of the European war. Quite early, considerable difficulty was experienced with regard to the supply of incandescent mantles; but happily, thanks to the organization and business acumen of the firms in this country, the trouble was in a very short time completely overcome. On his way to the works, his eye had been caught by a familiar poster, which said, with reference to another commodity, "Support home industries." It struck him that, judging from what he had read lately in the Technical Press, this advice was particularly appropriate at the present moment to the mantle industry of this country. In pre-war days the stress of competition was not felt as it unhappily was to-day through the abnormal economic conditions now existing. It was therefore up to the gas industry of the country to see that the English mantle manufacturing concerns were not allowed to dwindle and be ultimately extinguished. He did not for a moment believe that such a thing would come about; but if unfortunately it did, there would be an end to the cheap foreign mantle, irrespective of what the rate of exchange might be. This had been the experience in connection with other industries. Continental competitors knew what was being done in this country; and as long as England was manufacturing, they cut their prices down. But when manufacture ceased here, Continental prices went up to an exorbitant figure. The complete success of the afternoon's visit had been due to the efforts of a number of gentlemen who had been assiduous in their attentions during the tour round the works, and had explained the various processes in the clearest possible manner. To all of them he wished to express the indebtedness of the Association for what they had done, as well as to the Volker Lighting Corporation for having given permission to view the works and for the generous hospitality they had extended to the visitors.

Mr. S. B. CHANDLER, in proposing a hearty vote of thanks to the Corporation and the various gentlemen to whom the President had referred, said the visit had been of a particularly interesting character. Those among the older members of the Association who were privileged to take part in a visit to these works twelve years ago, would still remember the pleasant time they spent on that occasion, and the large amount of information obtained; and to-day's visit had been no less enjoyable and profitable. From what they had seen, there could be no doubt that the Volker Lighting Corporation carried out their work in an excellent manner, and with a thoroughness that would be hard to beat. In a lighting installation, the quality of the mantle was a factor of the first importance; and in this respect the Corporation's products, it was obvious, left nothing to be desired. The cordiality of their welcome had been very gratifying.

Mr. F. J. PEARCE, in seconding the motion, commented upon the large amount of useful information which the members had been enabled to obtain, owing to the manner in which every process of manufacture had been thrown open to them. They had admired the excellent lay-out of the works, and the many ingenious machines in operation for the manufacture of mantles which were of the highest quality obtainable.

Mr. C. S. GARLAND, acknowledging the vote, said that, for a number of reasons, it was a very great pleasure to him to see so many scientific men in the works. In the first place, this was so because he had very great confidence that English science would ultimately absolutely overrule German science throughout the world. He had been brought-up in that belief; and it was in that belief that these works had been developed to their present point. His second reason for being so pleased to see visitors was that the works were, in a way, his "baby." When he came there in 1909, the works were not so extensive, and the organization was not so complete, as was the case to-day. They had set out with the object of making this mantle business absolutely independent of all outside influences. Before the war, owing to the fact that the monazite sand was under the control of the Germans, they had a very hard struggle to keep free of German influence. But they had stood up to them, and had hoped for the aid of the British Government. This, however, was hard to believe in; for he had just come down from the Lord Justice's Court, where there had been argued a case arising out of the Safeguarding of Industries Act. In connection with this case, the position was a ridiculous one. Thorium and cerium were in the Act, and both were liable to duty if brought into this country in bottles; but if they were brought in in the form of gas-mantles no duty was chargeable, and so British labour was not protected. They had seen a factory that afternoon in which during the war and for some time afterwards there were between 700 and 800 workers, but which now contained no more than 350; and the decision to which he had just referred might mean still less employment for workers in this country in making mantles. In the same proportion as their output diminished, so did their costs rise; and to-day the price of gas-mantles would be considerably lower, if only the works were on full production. As he had said, they had set out to make this business absolutely independent. They had their own mines in Travancore, where 300 or 400 Indians would be employed extracting the sand. Those works were closed, because of German competition in mantles. They had in the North a works where the ramie fibre coming from China was reduced to a thick thread. That works was going about half-time. They had another large works where this thick thread was drawn down to a fine thread. That works was going at about one-third speed. They had three factories making mantle-rings. Two were closed down entirely, while the third was producing about one-third of the normal output, at a correspondingly higher cost. The same might be said with regard to other things. Under present conditions, they could not compete with German mantles; but the conditions were absolutely abnormal. The manufacturers here depended therefore upon the goodwill—and he was very glad to say that they had it—of gentlemen like the members of that Association, to keep the industry going through the bad time it was having and would continue to have until there was a crash in Germany. It was a pleasure to show visitors over the works, for there was nothing to hide. "Good ingredients and good work" were the principles upon which the works were run.

Mr. A. T. METCALFE, supporting, said that, in addition to good materials and good workmanship, one other thing was necessary—a scientific mind behind them. Now, Lighting Trades possessed a valuable asset in Mr. Garland to conduct their affairs. The afternoon had been a very pleasant one to all the members of the staff. They had been passing through a rather trying period; but it was occasions like this that enabled them to discern a certain amount of brightness. He hoped that on some future occasion the Association would pay them another visit.

GAS AND NURSING.

There was a combined air of comfort and utility about the annexe of the Royal Horticultural Hall, Westminster, occupied last week by the Gas Light and Coke Company, that attracted the attention of, and was favourably commented upon by, the numerous visitors. The occasion was the twelth annual Nursing and Midwifery Exhibition and Conference—an occasion which, as volumes of the "JOURNAL" for previous years have indicated, is invariably taken advantage of by the Company to make a strong appeal to the medical and nursing professions.

This year's exhibit was divided into two parts, with ample space between, to avoid crowding. One part was occupied by a completely equipped kitchen, in which was displayed a quantity of apparatus suitable for cooking on a large scale. One noticed a Davis roaster, a Fletcher-Russell roaster, a Fletcher-Russell steamer, a Davis double "Metropolitan" cooker, a Wilsons and Mathiesons copper, a Stott boiler, a Potterton circulator, a Spencer-Bonecourt gas-fired steam-boiler, a Still "Metropolitan" toaster, and a Fletcher-Russell hot closet suitable for about 300 plates.

On the other side of the annexe were two rooms. The first of these was tastefully arranged as a nurse's sitting room, fitted with a Wright "Cabinet" gas-fire—a fire with a griller attached, for preparing light meals. This combination fire and cooker is expressly designed for use in flats, suites of chambers, &c. There is a "Thermo-X" firefront: and immediately above this is a good-sized grilling oven, with fall-down front door acting as a withdrawal shelf. The top is closed with a hinged cover; and the grill deflectors may be lowered or raised as required for boiling or grilling. On the table was a portable gas light; while the walls were decorated with several framed sketches, each bearing a forceful appeal to visitors. The remaining room contained a patent combined kitchen and scullery cabinet, with a Richmond "Bungalow" cooker. This arrangement, which is entirely self-contained, is particularly suitable for small flats and kitchen-dining rooms. When closed up, it is just an ordinary piece of furniture—as little like a kitchen and scullery as one could possibly wish. There were also a bath fitted with a Ewart "Victor" geyser, having a shower attached; and a combined Davis steamless radiator and towel-rail.

The lighting of the whole exhibit was, of course, excellent; the "Nico" and other burners having pneumatic switches.

DEVIZES GAS-WORKS RECONSTRUCTION.

Inspection by the Council.

The completion of the scheme for the entire reconstruction of the plant at the Devizes Gas-Works—a scheme involving an expenditure of some £20,000—was commemorated on Wednesday last, when, upon the invitation of the Mayor (Councillor T. H. S. Ferris) and the Chairman of the Gas Committee (Councillor Fred. Chivers), the members of the Council made an official visit of inspection of the works. Prior to this, however, they were entertained at luncheon by the Mayor, who said he felt he could not let the completion of such an extensive scheme, and one which would materially affect the town in the future, pass without some commemoration.

His Worship submitted the health of the Contractors present—Mr. T. B. Walker (Managing-Director, Messrs. Gibbons Bros., Dudley), Mr. C. S. Bennett (Assistant Managing-Director of the firm), Mr. G. Coutts (representing Messrs. George Waller and Son, Stroud, and Messrs. Davison and Partner, Ltd., London), and Mr. D. H. Henshaw (representing Messrs. W. C. Holmes & Co., Huddersfield). All responded, and paid a high tribute to the ability displayed by Mr. W. J. Rendell Baker (the Engineer and Manager) in connection with the reconstruction. They commended the scheme and excellent management of Mr. Baker, and eulogized his work, as well as commenting upon the fact that he had seen the scheme through to its present successful completion without the services of a consulting engineer. Humorous references were made to the obsolete character of the old plant, and wonder expressed at the production secured from it. The statement was made that, with the up-to-date plant now installed, considerable benefit would very shortly accrue to the town and the ratepayers generally.

Proposing the toast of the Mayor and the Corporation, Mr. Bennett took the opportunity, on behalf of the Contractors concerned, of presenting to the Chairman of the Gas Committee a silver salver. Mr. Bennett said the Contractors did this in order to show their appreciation of the consideration the Contractors had received at his hands. He had always treated them well. This was suitably acknowledged by Councillor Chivers. The Ex-Mayor (Alderman J. F. King) submitted the health of the Manager, who, he said, had honestly done his best for the town, and had worked night and day to secure the gas supply for the inhabitants. This toast Mr. Baker acknowledged, and said he had certainly left nothing undone to ensure a continual supply for the town during the time of the reconstruction. He was proud to be able to say that he had accomplished this, though in some cases he had had to work day and night.

The party then proceeded to the gas-works, of which they made a tour. The plant has been completely modernized; the principal features of the work being the reconstruction of the retort-bench with stoking machinery, coal-breaker, and elevator, the installation of a Livesey washer and tar extractor, the re-erection of the tower scrubber, a new rotary washer-scrubber, improved plant for sulphate of ammonia manufacture, building and installing pumps for dealing with tar, ammoniacal liquor, and water, installing exhausters, and building workshops and stores. It is interesting to note that the scheme, which was prepared by the present Manager, was approved in its entirety by Mr. W. Doig Gibb, C.B.E., M.Inst.C.E.

The outstanding portion of the reconstruction is, of course, the replacing of the old hand-fired 9 ft. retorts by three beds of 15 ft. through retorts, and the installation of a Guest-Gibbons electrically operated stoking machine. The old exhauster-house has been converted into a modern engine-room, which contains two 25 KW. Sisson (Electric Construction Company) direct-coupled generating sets of 250 volts, with a switch-board containing the necessary instruments, circuit breakers, &c. The pump-house has been re-erected, and contains new steam-driven pumps to deal with tar, ammoniacal liquor, and water. A new water-gas plant has also been provided, of a capacity of 300,000 c.ft. per day. With regard to the exhausters, the old belt-driven ones have been replaced by a pair of modern steam-driven Waller exhausters. The sulphate of ammonia plant has been entirely reconstructed; and a steam-boiler has been installed, with Holmes stills and superheaters, liming apparatus, and Taylor's saturator and leadwork. New Braddock governors have been put down in place of two old ones, and a further one modernized; all three being water loaded. In addition, modern workshops have been equipped with power and tools for dealing with repairs.

The whole of the work has been carried out by Mr. Rendell Baker without the assistance of a clerk of works.

Chemistry and Technology of Petroleum.—For the forthcoming summer term of the South-Western Polytechnic Institute, Manresa Road, Chelsea, S.W., there has been arranged a course of ten lectures on "The Chemistry and Technology of Petroleum, which it is felt should prove of great service to those who wish to acquire an insight into this increasingly important subject. Mr. Fred Esling, B.Sc., A.C.G.I., will deliver the lectures on Thursday afternoons at 2 o'clock, commencing April 27. The fee for the course will be 10s.; and after each lecture a practical class will be held.

THE ROTAMETER.

There are many uses for a direct reading, sensitive, and accurate instrument for measuring the flow of gases and liquids; and these qualities are claimed by the "Rotameter"—a device which has no mechanism to get out of order, and which can be employed for oils, acids, alkalies, and other corrosives. Among its other uses are the measurement of gas for burners, engines, &c., the correct proportioning of the gaseous mixture in oxy-acetylene welding, and as maximum demand meters. For laboratory and research work, instruments can, it is learned, be supplied to give accurate readings down to one-hundredth of a cubic foot per hour, and for industrial uses up to 100,000 c.ft. per hour. The scale can be graduated to read in cubic feet, gallons, litres, pounds, &c., per hour or per minute, while pressures up to 120 lbs. per sq. in., and temperatures up to 220° C., can be dealt with.

The instrument consists of a vertical transparent tube, with a bore tapering towards the lower end. Within the tube is a circular top-shaped float; and the stream of gas or liquid flowing through the tube lifts the float. By means of an accurately calibrated scale on the transparent tube, the quantity of gas or liquid passing through is directly read off the scale from the position of the float. It is in the peculiar construction of the float (which is kept in rapid rotation by the stream flowing past it) that the accuracy of the instrument is said to lie. The float does not touch the walls of the tube; and there is no friction. It is explained that the rotational movement of the float is much more sensitive to disturbance than the vertical movement; and consequently there is a continuous check upon the accuracy and proper functioning of the instrument. Should the float and tube at any time become sufficiently fouled, the float will cease to rotate; and the rotation ceases long before the accuracy of the vertical motion of the float—and consequently of the readings—is appreciably affected. "Rotameter" readings are dependent upon the density, temperature, and pressure of the gas. The pressure drop caused by its insertion in the pipeline is very small. The upkeep cost is *nil*.

The "Rota-Regulator," which is similar in construction to the "Rotameter," but lower priced, is useful for purposes where it is required to keep a flow of gas or liquid constant in amount, but where the actual rate of flow does not need to be known or is otherwise ascertained.

Various patterns of the "Rotameter" are provided for special purposes. Where an accurately proportioned mixture of gases is required, a twin instrument is supplied, enabling the operator to maintain the correct mixture by merely observing the positions of the floats.

These instruments are made at the Rotaworks, Aix-la-Chapelle, and distributed in Great Britain only by Messrs. Trost Bros., of No. 26, Little Park Street, Coventry.

A German Exhibition.

"Das Gas- und Wasserfach" announces that, in connection with the annual meeting of the German Gas Association, to be held at Hamburg, June 26 to 28, there will be an exhibition of appliances and other things of interest to the gas industry. It is to extend from June 24 to July 5, and will be open to the general public except during the period of the Association meeting. It is intended to show new departures in manufacturing and consumption appliances, works organization, and salesmanship, including propaganda. Any firms, associations, or works, which have anything new to offer, are invited to help to make the exhibition a success, and to apply for space before May 1.

Charcoal for Sulphur Extraction.—An outline of the work done in the University of Illinois on behalf of the gas industry was given by Prof. S. W. Parr at the recent meeting of the Illinois Gas Association. Among the researches being carried out are some which are designed to ascertain the behaviour of sulphur under various conditions. It was hinted that coke may eventually be employed for purification purposes, though this remains to be seen. It has been shown that charcoal can be used, at least in the laboratory, to pick up as high as 12 p.ct. of sulphur, and that it is possible to discharge it from the charcoal. With coke it has been found possible to pick up 7 and 8 p.ct. of sulphur; but whether the sulphur can again be discharged, and whether the whole idea will ever be commercially practicable, has not yet been determined.

Gas Consumption for Bakers' Ovens.—The following figures of gas consumption, &c., are published in connection with a travelling type of baker's oven in use in Toronto; the dimensions being 100 ft. long and 9 ft. wide, and the number of burners 106; maximum gas consumption per burner, 55 c.ft. per hour; temperature required, 400° Fahr.; time needed to obtain working temperature, 1½ hours; amount of gas to heat-up oven, about 5000 c.ft.; average number of burners in use while baking, 85; gas used during a six hour run, 24,100 c.ft.; baking time for each load, 35 to 55 minutes, according to variety; total production during a six-hour run, 13,038 loaves. After the gas is shut off, a quantity of buns are run through, thus making use of the heat remaining in the oven. There are six of these ovens at present installed in Toronto; and orders for two others are in hand. Users are very well pleased with them.

REGISTER OF PATENTS.

Gas-Fired Boilers.—No. 175,737.

BELL, W. T., and WELLS, J., of Lincoln.

No. 32,597; Nov. 18, 1920.

By this invention a boiler is constructed with two nests of horizontal fire-tubes situate above and below the central horizontal line of the boiler. The lower nest reaches nearly to the bottom of the boiler, and has a greater heating surface than the upper nest. On one side of the boiler are two chambers; the upper one forming the gas inlet and combustion chamber, and the lower the gas outlet chamber. The upper chamber has a baffle through which the hot gases pass into the upper nest of tubes.

The gas inlet is arranged at the side, and cleaning doors are provided; the space between the baffle and the tubes forming a dust chamber. The gas outlet is arranged below the gas inlet chamber, and is connected to a chimney positioned on the side opposite to that of the gas inlet. These chambers and baffle are constructed from reinforced concrete or firebrick, or a combination of both. At the other end of the tubes is a chamber common to both nests of tubes.

Instead of arranging the gas inlet chamber at the top, it may be at the bottom and the gas outlet chamber at the top.

Incandescent Gas-Lamps.—No. 175,786.

SHAW, E. J., of Walsall.

No. 33,953; Dec. 1, 1920.

This invention relates to incandescent gas-lamps in which a bowl of glass, alabaster, or similar translucent material is arranged to tilt to allow of access to the burners.

The lamp comprises in combination a bowl of translucent or light-diffusing material secured to a rim or gallery, an outer ring in which the bowl-carrying rim or gallery is pivotally mounted at diametrically opposite points, and suspension tubes supporting the outer ring. The incandescent burner is arranged below the level of the outer ring, and is supplied from one of the suspension tubes through a radial arm traversing the bowl-rim and outer ring; this radial arm forming one of the pivots for the bowl-rim inside the outer ring.

Fuel Distillation and Steam-Power Plant. No. 175,800.

MERZ AND MCLELLAN, and BOTTOMLEY, W. T., of Newcastle-upon-Tyne, and WEEKS, E. G., of Monkseaton.

No. 34,261; Dec. 3, 1920.

This invention relates to fuel-distillation and steam-power apparatus, and particularly to a method of obtaining steam for low-temperature carbonization plant run in conjunction with large power-stations, and has special application in cases where the make-up water is not suitable for use in boilers without purification. It has been found that in arrangements where the steam for the low-temperature carbonization retort is obtained from a steam power-unit (conveniently an intermediate stage of a turbine), the heat remaining in the steam and gases leaving the retort is usually more than sufficient to heat the feed water passing from the turbine hot-well to the boilers. In the arrangement suggested, it is proposed to heat the feed water in the normal way by bleeding a turbine or by bleeding auxiliary turbines in several stages or in a single stage. The heat in the steam and gases leaving the distillation retort is used to evaporate the make-up water required to replace the condensed steam thrown away, after having passed through the retort, owing to its unsuitability for re-use in boilers by reason of contained impurities.

The method consists in passing steam from a steam power-unit through a low-temperature distillation apparatus and thence, together with distilled gases therefrom, through heat-exchanging apparatus, passing make-up water therethrough to evaporate it, and introducing the clean make-up steam thus produced into the power-plant at a stage working at a pressure substantially equal to that of the make-up steam. The necessary plant is specified.

Coking of Coal.—No. 175,888.

ILLINGWORTH, S. R., of Treforest.

No. 3923; Feb. 2, 1921. (Patent of Addition to No. 164,104 of Feb. 28, 1920.)

This invention relates to the production of various types of coke, and is an improvement on the process described in the specification No. 6078 of 1920.*

The majority of coals, particularly the highly bituminous coals, when carbonized at low temperatures (up to 600° C.), give soft porous products, which readily disintegrate with handling and during transport. In order to overcome this difficulty various means have been suggested, which in the main have depended on mechanical compression of the charge, either by virtue of some special type of oven or at some stage after discharge therefrom, by the addition of pitch binders and the briquetting of the mass carbonized at low temperatures. Subsequent carbonization at higher temperatures has been advocated. By the present invention, the patentee claims, without the use of compression or the addition of binders, to produce at low temperatures dense, hard fuel concurrent with the production of excellent yields of bye-products such as oils and ammonia. This fuel has all the physical characteristics of metallurgical coke, and can be converted into the latter by heating the product formed at low temperatures (say under 600° C.) to higher temperatures up to 900° to 1000° C.

The process comprises the following operations: First, preheating the coal to obtain a product of the nature required for the second operation. Secondly, crushing (if necessary) this product and carbonizing it at temperatures not exceeding 600° C. but preferably not exceeding 500° C. This operation is designated as the "formation of coke structure," since in this operation the resinic matter in the residue is wholly destroyed as such, and when this has taken place the mass cannot again be brought into a plastic state by heat—that is, the texture of the product cannot undergo appreciable change. The product at this stage is smokeless fuel. Thirdly, if and when desired, further coking the product of the second operation at temperatures above 600° C. If true coke—*i.e.*, a coke of low volatile content—is desired, the product from the second operation is passed (as soon as all the bye-products have been evolved at the working temperature) to an oven maintained at any temperature above 600° C., in order to eliminate the desired amount of volatile matter from the smokeless fuel. At 900° C. the product loses substantially all volatile matter.

The preheating operation depends on the nature of the coal—first the coal must contain the requisite quantity of resinic matter to cement the coal into coke. In specification No. 6078 of 1920, it was shown that the resinic matter in coal is of varying degrees of stability, and that associated with it are various types of non-cementing material of varying degrees of stability. Now by the employment of suitable temperatures it is possible to eliminate from a coal certain portions of these constituents and to leave a residue which contains a more homogeneous type of resinic matter—*i.e.*, the resinic matter in the residue is decomposed between short limits of temperature. Further, this resinic matter is associated with a small amount of other substances decomposable at the same temperature as the resinic. Therefore, when the formation of coke structure subsequently takes place, the plastic mass is under the least possible distending influence—that is to say, the least possible quantity of volatile matter is evolved at this stage.

The specification gives examples to make the inventor's proposals clear.

* See "JOURNAL," July 13, 1920, p. 106.

Coin-Freed Gas-Meters.—No. 176,078.

ROGERS, R. J., and TURNBULL, J. W., of Birmingham.

No. 33,100; Nov. 24, 1920.

This invention relates to improvements in coin-freed gas-meters, adapted to be actuated either by shillings or by pennies to deliver a corresponding volume, in which the gearing is extremely simple and the change of gearing to convert the meter from a shilling meter to a penny meter or *vice versâ* can be rapidly and easily effected.

Of the illustrations reproduced, fig. 1 is a part sectional plan of the mechanism; the reduction gear being shown in mesh as for shilling-in-the-slot working. Fig. 2 is a detail view of the reduction gearing meshed as in fig. 1.

When the meter is being used as a penny meter, the worm-wheel A is engaged and rotated by a worm B carried by a cross-shaft geared by bevel wheels to the recording mechanism. When it is desired to convert the meter for shillings, the outer end of the shaft is traversed to disengage the worm B from the wheel-worm A. This movement is rendered possible by forming the bearing for the outer end of the shaft

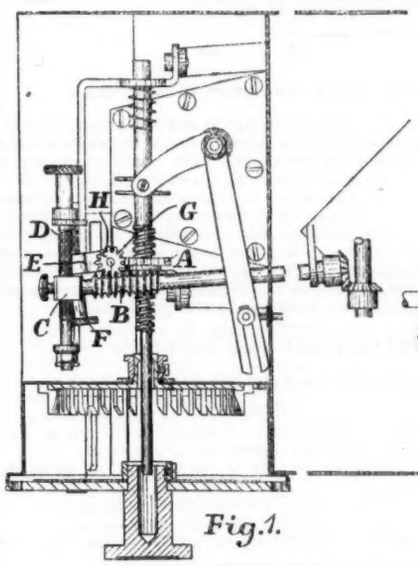


Fig. 1.

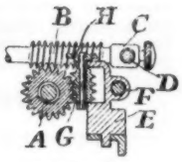


Fig. 2.

Rogers' and Turnbull's Coin-Freed Meters.

in a block C mounted on a threaded spindle D which may be rotated by a milled head to traverse the block C. The latter may be locked in any desired position by a grub-screw with a milled head. The inner bearing of the shaft is formed with sufficient play to allow the slight necessary change in angularity of the shaft without affecting the engagement of the bevel wheels.

A bracket E, which is mounted on a slide arranged at a slight angle, and traversed by a screwed rod and milled head F, carries a vertical countershaft on which is a worm G and a worm-wheel H. The mounting is traversed by the screw rod till the worm G engages the worm-wheel A, and the spindle is moved back slightly until the worm B engages the worm-wheel H. The arrangement of the slide E., &c., when the countershaft is brought into gear is clearly shown in the detail view. The drive from the recording mechanism is then through the spindle worm B, worm-wheel H, countershaft worm G, and worm-

wheel A, to the valve-actuating spindle, and the gearing is so arranged that this is driven at one-twelfth of its former speed. Thus twelve times the volume of gas is allowed to pass through the meter for the same travel of the valve-actuating spindle.

Carriers for Gas-Mantles.—No. 176,478.

Carpenter, C., of Old Kent Road, S.E.

No. 34,132; Dec. 2, 1920.

This invention relates more particularly to the type of carrier comprising a ring having supporting lugs and provided with an additional ring or flange which strengthens the ring and enables the carrier to be readily handled without damaging the mantle. The strengthening ring or flange or the carrier ring itself is so perforated or cut away as to restrict or deflect as little as possible the ascension of the hot air and gases from the exterior of the mantle.

The specification describes six modifications of the invention.

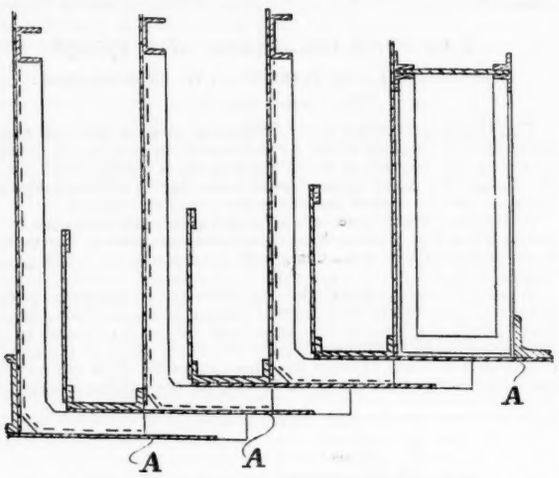
Gasholders.—No. 176,232.

Dempster, R. & J., Ltd., Beard, G. F. H., and Scott, J. W., all of Manchester.

No. 4272; Feb. 5, 1921.

The object of this invention is to enable the cup portions of a holder to be retained in the circular form desired, in operation, more effectively than heretofore, by providing, at or near the base portions of the cups, projecting plates which are continuous all round the holder, with or without contact means between a plate and a holder stay.

One form of the invention is illustrated by the accompanying sectional elevation of cup portions of a four-lift telescopic holder, at one extreme part of a diameter. Plates A are shown attached to the bottom channels, which plates in each case extend right round the circumference of the holder as in the case of the bottom channels themselves,



Beard's and Scott's Improvement in Holder Cups.

the various sections being joined together in any desirable manner. In this way, the area of material for resisting distortion is effectively increased, and without altering the width of the cup in each case, the extension referred to being continuous all round the circle.

Stays H of vertical type (and here of channel section) are indicated, but according to the patentees' invention are provided with bent or horizontal foot portions, with the edges of which the plates A are capable of coming in contact when the lifts are down; the contacts being removed successively as the inner lift and the others are raised by the incoming gas. Various modifications of the strengthening principle and of the stays are described in the specification.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 5.]

Nos. 8720 to 9469.

Brady, J.—"Plug joint for pipes or valves, &c." No. 9409.
Cleary, E.—"Incandescent gas-mantles." No. 9460.
Clemm, H.—"Process of recovering waste heat of gases and vapours." No. 9426.
Colman, H. G.—"Treatment of hydrocarbons." No. 9316.
Dickie, J.—"Means for connecting pipes, &c." No. 9193.
Fisher, A.—"Process of manufacturing smokeless, &c., fuel from coal." No. 9247.
Forwood, G. F.—See Colman, H. G. No. 9316.
Gedge, F. G. P.—"Pipe joints." No. 8749.
Goodridge, A. J.—"Apparatus for repairing broken pipes." No. 9124.
Hearson, J. W.—"Complete gasification plant." No. 9127.
Klerner, H.—"Pipe joints." No. 9244.
Lofthouse, A. G.—See Hearson, J. W. No. 9127.
Midland Coal Products, Ltd.—See Fisher, A. No. 9247.
Mitchell, J. B.—"Incandescent gas-burners." No. 9440.
Moore, S.—"Chambers for receiving and delivering coke from gas-generators, &c." No. 8895.
Pearce, F. R. R. J.—"Boiler for gas-stoves." No. 9288.
Schneider, A.—See Clemm, H. No. 9426.
Taplay, J. G.—See Colman, H. G. No. 9316.
Thomas, J. W.—"Slot indicator for gas, &c., meters." No. 8862.
Yeoman, E. W.—See Colman, H. G. No. 9316.
Zellstoffabrik Waldhof.—See Clemm, H. No. 9426.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Blackburn Corporation Bill: Brought from the Commons; read the first time; and referred to the Examiners.

Doncaster Corporation Bill: Read the third time; passed; and sent to the Commons.

Stretford and District Gas Board Bill; Read the third time; passed; and sent to the Commons.

A Petition has been deposited on behalf of the Chester Corporation against the Chester Gas Bill.

HOUSE OF COMMONS.

Progress of Bills.

Blackburn Corporation Bill: Read the third time, and passed.

Doncaster Corporation Bill; Read the first time, and referred to the Examiners.

Sheffield Gas Bill: As amended, considered; and to be read the third time.

Stoke-on-Trent Corporation (Gas Consolidation) Bill: Standing Orders not previously inquired into complied with; and to be read a second time.

Stretford and District Gas Board Bill; Read the first time, and referred to the Examiners.

Windsor Gas Bill: Standing Orders not previously inquired into complied with, and the Bill committed.

Gas Regulation Act, 1920.

Drafts were presented of Special Orders proposed to be made by the Board of Trade under Section 10 of the Act, on the application of the Wellington (Salop) Gas Company, Weston-super-Mare Gas Light Company, Romford Gas and Coke Company, Ltd., Borough of Calne.

Public Utility Companies (Capital Issues) Act, 1920.

Copy presented of a report by the Board of Trade under the Act on an application by the Runcorn Gas Company.

A FIFE GAS-WORKS ORDER.

A Provisional Order Inquiry has been held in Edinburgh, before Lord Chalmers (Chairman), Lord Meston, Sir Henry Craik, K.C.B., M.P., and Mr. J. A. M. Macdonald, M.P. The Clerk was Mr. Robert Hendry.

The Order was promoted by the Buckhaven, Methil, and Innerleven Town Council, with a view to amalgamating with the Leven Town Council, and forming a Joint Commission to carry on the manufacture of gas in two works (one in Leven) at present owned by the Buckhaven Town Council. The objectors were the County Council of Fife, and the Kennoway and Windygates Gas Company. It was argued that the Order simply sought the transfer of powers already conferred by the Burghs Gas Act.

After hearing Counsel, the Commissioners retired to consider the *locus* of the objectors. On returning to Court, Lord Chalmers announced that they disallowed it, and would report the Order to the Secretary for Scotland as unopposed.

WORTHING CORPORATION BILL.

Opposition by the Worthing Gas Company to the Electricity Extension Powers.

Part IV. of this Bill (which came before the Local Legislation Committee of the House of Commons on Tuesday, March 28, presided over by Mr. E. Gardner) proposes to extend the limits of supply of the electricity undertaking of the Worthing Corporation beyond the borough boundary, to include the parish of Durrington. A petition was lodged by the Worthing Gas Company, on the ground that they were large ratepayers in the district, that the new area would prove unremunerative, and that any deficiency would fall upon the rates.

The promoters were represented by Mr. W. J. Jeeves, K.C., and Mr. Villiers Bayly, and the petitioners by Mr. A. M. Paddon.

Mr. Jeeves, in opening, gave particulars of the Corporation's electrical undertaking to show that it was well-managed, with excellent results to the consumers and to the community. The Corporation began to supply electricity in 1903; and the capital invested up to the present time was £120,000, of which no more than £68,933 was outstanding. The number of consumers supplied from 1903 to 1921 had increased ten times. As was usual with all such undertakings, there had been a loss during the first few years, up to 1906, the total deficiency during that period amounting to £4678. Since then it had been self-supporting; and it had been the policy of the Corporation that it should be neither a burden nor an assistance to the rates. The maximum charge was fixed at 8d. per unit; and the Corporation had never increased prices beyond that, even during the war period. Of 13 towns in the south of England, there were only three charging less than 8d. The Worthing Corporation were still able to keep within their maximum, though charges had been increased by 60 p.ct. since 1914. As to the Gas Company, they had been doing well alongside the electricity undertaking, and Counsel expressed the opinion that it was a little late in the day for a gas company to offer opposition to a

proposal to give another area the benefit of electricity supply. In the early days gas companies feared they would be hard hit by the competition of electrical concerns. Experience had shown, however, that instead of gas companies having to face a less prosperous era, they had met with increased prosperity. In the petition it was stated that the Gas Company objected, as ratepayers, to contributing towards a subsidized undertaking; but he (Mr. Jeeves) asked what subsidizing there had been. There had been no subsidy since 1906, and it was not proposed there should be now. The Gas Company also stated that they were able to meet the demand for lighting and heating in the parish of Durrington; but again Counsel submitted that this argument was out-of-date. All ratepayers, he said, other than the Gas Company, had apparently approved, because nobody else had raised an objection at the Borough Funds meeting.

Mr. G. Porter (Chief Electrical Engineer to the Worthing Corporation), giving evidence, said that there had been a steady increase in gross revenue since the war of about £5000 per annum. A number of tables were put in to show that the charges in Worthing compared favourably with many similar undertakings on the south coast. As to the proposed extension, it was desirable, both in the interests of the public and of the Corporation, that a supply should be given to the parish of Durrington, which was in the rural district of East Preston, and the step which the Corporation proposed was a prudent one.

Mr. PADDON cross-examined on behalf of the petitioners. He elicited from witness that the parish of Durrington comprised about 4 square miles, and there were three groups of houses, one of which the Corporation did not contemplate considering at present. In the whole of the area over which the Corporation proposed to take powers, said Counsel, there were only 312 houses. Of these, 136 were rated at £10 or under; 91 between £10 and £20; 76 between £20 and £50; and only 9 were over £50. Out of the 312, 139 were already supplied by the Gas Company, and 40 houses were situated in the part which the Corporation did not intend to consider. Further questions put by Counsel drew the answer that written requests for a supply of electricity had been received from two people living in the district, and there had been other verbal requests. Examining a number of tables which had been put in by the witness, Mr. Paddon said it would appear that in 20 years working of the undertaking the Corporation had incurred a loss in 11 years, and a profit in nine years. He admitted that four of the 11 were war years. There was a deficit of £4200, which had never been liquidated; but witness said that it would be liquidated in time. Mr. Paddon pointed out that the depreciation fund had now been exhausted, so that, even when charging at the maximum rate, the Corporation had not been able to keep the undertaking free from loss. In addition to the losses incurred during the first few years, there had also been losses from 1916 to 1919 inclusive, and in 1921. Witness explained that in 1921 the loss was due to the Corporation having paid a large sum of money for a new engine, which, owing to strikes, had not been delivered, and they had to turn to an uneconomical steam plant. Counsel then went on to point out that under section 6 of the Electric Lighting Act of 1909 the Corporation could have obtained powers to supply anybody outside their area who were under exceptional circumstances, and witness admitted that they could have approached the Electricity Commissioners for the necessary powers.

Re-examining, Mr. JEEVES pointed out that an Order might have been obtained from the Electricity Commissioners; but the Corporation had decided that, as they were in Parliament, it would be better to have the powers under their Act. There were other things in the Act connected with electricity for which Parliamentary sanction was necessary. As to the houses in the new area which were already supplied with gas, witness agreed with Counsel that there were houses in Worthing supplied with both gas and electricity, and that both had limited spheres. A supply of electricity would not harm the Gas Company. Figures were quoted to show that many houses had been occupied in the new area during recent years, and that another twelve were ready for assessing, which indicated a tendency to development in the area. As to the position of the Gas Company with regard to the rates, this assessment, said Counsel, was about one-hundredth part of the total assessment of the borough, or less than one-ninetieth part; so that if there were any loss they would only have to pay that percentage of it.

This closed the case for the promoters.

Mr. *William Cash* (Chairman of the Worthing Gas Light and Coke Company), giving evidence for the petitioners, said that the Company were simply seeking protection against extra rates; their view being that the proposed extension would prove to be unremunerative. If the Corporation desired to go into the parish of Durrington, it was unfair that the undertaking should become a charge on the rates. The Company felt that it might, having regard to the past history of the electricity undertaking. The Company were the largest ratepayers in the borough, he believed—either the Gas Company or the Railway Company were. The Gas Company's total rating assessment was £2647. Witness put in a number of tables dealing with the finances of the electricity undertaking, giving the net revenue account of the concern for the years 1914-1921, the working of the depreciation fund, and the revenue account receipts for the same period. The first showed a debit balance in the five years 1915-1919, and in the year 1921. It also set out the sums contributed out of local rates to meet losses between 1902 and 1906, amounting to £4768; but against this, £500 was contributed out of profits to local rates in 1914. The second table, dealing with the depreciation fund, showed that this fund was completely dissipated in 1920. As to the rates paid by the Company, witness said that they amounted to £1879 in 1921. The question of rates was a very important one from the point of view of the Company, because the amount paid affected the price of gas. Witness then handed in a copy of the following clause, which the Company asked should be inserted in the Bill. It provided for the revision of electricity charges in order to balance revenue and expenditure.

(1) The Corporation shall, so soon as the annual statement of accounts of their electricity undertaking has been filled up in the form prescribed by the Board of Trade under the Electric Lighting Act, 1882, publish in a newspaper circulating in the borough a notification that such statement of accounts has been filled up and that copies of it can be obtained at the offices of the Corporation at a price not exceeding 1s. a copy, and such publication shall be in addition to, and not in substitution for, any publication prescribed by the Board of Trade under the Electric Lighting Act, 1882.

(2) The Corporation shall, on the expiration of the third complete financial year after the passing of this Act, and on the expiration of each third succeeding year, reconsider, and, if necessary revise, and thereafter maintain the scales of prices charged by them for electrical energy so that, so far as is reasonably practicable, no rate will be required for the purpose of defraying the future expenses of the said undertaking during the next three years. Provided nevertheless that—

(*a*) The prices to be charged shall not exceed the maximum prices which may be charged under the Worthing Electric Lighting Order, 1895.

(*b*) The scales of prices so reconsidered and revised may be from time to time in like manner reconsidered and revised by the Corporation.

(3) Nothing in this section contained shall prevent the Corporation from entering into contracts for periods which may extend beyond the periods at which any revision may take place under the provisions of this section on special terms under special circumstances not applicable to ordinary consumers, but each such contract shall provide that the price to be charged for energy supplied under such contract shall either

(*a*) be subject to revision at the next triennial revision provided for in this section; or

(*b*) vary in the same proportion as the prices charged to ordinary consumers;

Provided that the Corporation shall not, without their consent, be required to accept any price lower than the minimum price mentioned in such contract.

(4) There shall not be made against the borough rate or the general district rate or any other rate for energy used by the Corporation for street lighting or any other purpose a charge at a higher price than that charged to consumers using energy for similar purposes and for like hours of supply.

It was submitted that a clause on similar lines to this one had almost invariably been granted by Parliament when the request was made.

Mr. JEEVES, cross-examining, said that the Gas Company had paid £71 towards the deficiency mentioned in the years 1902 to 1906, and asked whether it was suggested that the payment of that sum (extending over a period of five years) sixteen years ago, was justification for asking for the insertion of the clause.

Witness said it was. He also pointed out that the Company were contributing to the rates in the period mentioned, and there was also public lighting, which was a charge on the rates.

Mr. JEEVES said that many of the losses were due to charging too little for public lighting, and that had they been charged to public lighting they would not have appeared as a loss on the undertaking. If he were right in making that suggestion, the Gas Company actually did not contribute to a loss on the undertaking at all. Continuing, he said that after 1906 the undertaking had arranged its charges so as to make revenue meet expenditure, subject to the war conditions. In the year ended March 31, 1915, after having made a profit continuously for eight years, the undertaking made a loss of £204. It was only when the war began that there was a deficit. Then in 1921, when costs of labour and materials were very high, there had been a loss of £1058; but against this there was a surplus in the previous year of £1200. Of the 1921 deficit, £1000 was attributable to delay in delivery of machinery, so that even in that year of high prices the real deficit was only £58. He did not think it could be seriously said that on such a history the Committee would be justified in placing upon the undertaking a burden which had never been put upon them from the time it was started. Examining the clause, he pointed out that the Gas Company were under an obligation to make their accounts public. It was unnecessary for the electricity undertaking to advertise them in a local newspaper, because they were also under an obligation to make their accounts public.

Examining the third part of the clause, Counsel said the effect would be to prevent the Corporation from entering into a contract with a big consumer of electricity extending beyond three years, at a fixed price; but witness disagreed. Assuming, he said, that the clause had been in operation during the war period, nothing could have been better for the Corporation or any other undertaking. The clause had been inserted in Acts of Parliament over and over again. Counsel remarked, however, that it had also been refused. The clause was formulated before a Committee of the House of Lords, presided over by the late Duke of Northumberland, in the early days, when the gas companies feared the effect of the competition of electricity undertakings.

Mr. PADDON, re-examining, said that the clause had been inserted on many occasions since it was first formulated, and precedents were quoted, some of which were disputed by Counsel for the promoters. Finally he got from witness that if it were the policy of the Corporation not to fall on the rates in respect of the electricity undertaking, it would not harm them.

Mr. PADDON then addressed the Committee, as he did not propose to call further evidence. The Company had not petitioned from any selfish motive because the competition would interfere with their business. They would not oppose it if the promoters would give them a reasonable amount of protection against what had happened in the past, and was likely to occur in the future. The district which it was proposed to add to the electricity undertaking's area of supply was sparsely inhabited. There was already a supply of gas there; the Company being under statutory obligations to supply. If, after having made a deficit in eleven years out of twenty, the Corporation came out to a district in which they could not raise a rate in the event of a loss, and entered into competition there with another undertaking who were also ratepayers in the Corporation's area, then the Gas Company should be given that protection which Parliament had decided in innumerable cases should be given to companies who were in similar circumstances. He did not think that in all his experience a stronger

case had ever been put before a Parliamentary Committee. Mr. Jeeves had emphasized that the whole aim of the electricity undertaking was that no loss should fall on the rates. But they had not lived up to their aspirations. They had fallen on the rates in the early days, and then, after a reasonable interval, losses had occurred again. It was true that the second series of losses had been met by accumulations of revenue provided for such contingencies; but it showed that during the last six or seven years their financial position had been precarious to the last degree; and it did not afford the Gas Company confidence when the Corporation sought to do something which municipalities should not do in the ordinary way—*i.e.*, to risk the ratepayers' money in a district in which they could not raise rates. With regard to the suggestion made by the promoters as to the impracticability of the clause put forward, it had been inserted many times; and the Electricity Commissioners themselves had inserted the clause in Orders they had made. It had had a most useful effect in establishing a principle—as much in the interests of public undertakings as in the interests of those seeking to have it inserted.

Mr. Jeeves addressed the Committee on behalf of the promoters. Unless the Gas Company doubted the Corporation's sincerity, he contended the clause was not needed. The Corporation felt that to have the clause put upon them after so many years would only be justified if, in point of fact, they had so acted as to make it reasonable. He again went over the ground with regard to the losses made in the working of the undertaking, and emphasized the fact that the losses incurred during the years 1915 to 1919, and the year 1921, were met by accumulations of revenue. The profits made were more than adequate for the purpose. Therefore, it could be said that the undertaking had more than paid its way from 1907 to 1920, taking the years as a group. The cause for the deficit in 1921 was a special one. The Committee would only be justified in hampering the electrical industry if it were shown that the Corporation had acted improperly and needed to be checked; and he asked the Committee not to encourage what he ventured to think was petty opposition.

The room was cleared, and on re-admission of the parties,

The Chairman announced that the clause giving the Corporation power to extend their area of supply should remain in the Bill, and that the Committee could not agree to the insertion of the clause suggested.

LEGAL INTELLIGENCE.

IMPORTED GAS-MANTLES AND TAXATION.

Position under the Safeguarding of Industries Act.

The special case stated under section 19 of the Arbitration Act, 1889, by Mr. Cyril Atkinson, K.C., for the opinion of the Court upon a question of law, was heard before the Lord Chief Justice, Mr. Justice Sankey, and Mr. Justice Green in the King's Bench Division of the High Court of Justice on Friday last.

The case had been stated at the instance of the Incandescent Gas-Mantle Manufacturers' Association and others, who took objection to an alteration of the wording of the Referee's decision after it was delivered, which they said left the position as to the real effect of the decision in considerable doubt. It was also contended that the Referee was *functus officio* after he had delivered his decision in the first place, and therefore was not entitled to alter the wording of the award. Reports of the proceedings before the Referee appeared in the "Journal" for Dec. 7, 14, and 28 last (pp. 695-7, 754-5, and 886).

Mr. T. Terrell, K.C., and Mr. A. M. Latter, K.C., appeared for the Incandescent Mantle Manufacturers' Association; Sir A. Colefax, K.C., and Mr. Trevor Watson, for the Thorium Manufacturers; Mr. Whitehead for the Board of Trade; and Mr. Hunter Gray, K.C., and Mr. Jacques Abady for the National Gas Council.

Mr. Terrell said the question for the Court was whether the finding of Mr. Atkinson, the Arbitrator appointed under the Act, was one which ought to be reviewed—in other words, what was the true construction to be placed on the Safeguarding of Industries Act, 1921. The Act imposed duties of Custom on certain goods with a view to safeguarding certain special industries, and the safeguarding of employment of industries in the United Kingdom against the effects of depreciation of foreign currency and the importation of foreign goods below the cost of production. Of course, the title of an Act of Parliament could not be read with a view to controlling the sections in the Act; but the Court could read the title and the preamble for the purpose of seeing what was the mischief the Legislature intended to correct. The title began by imposing duties of Customs on certain goods; and the Court would have to consider the meaning of the word "goods." The object of the Act was stated in the preamble. Section 1 provided that, subject to the provisions of the Act, there should be charged, levied, and paid on the goods specified in the schedule on the importation thereof in the United Kingdom duties equal to one-third of the value of the goods. Section 4 provided that where an imported article was a compound article of which an article liable to duty under this section was an ingredient or formed part, no duty should be charged under this section in respect of the compound article if the compound was of such a nature that the article liable to duty had lost its identity; and any dispute as to whether an article had lost its identity should be determined by an arbitrator.

The Lord Chief Justice: Do you say that this section means that though the compound article is not to be liable to duty, nevertheless the ingredients are liable if they would be liable in themselves?

Mr. Terrell said his contention was that if there was a substance which was a compound article, and the dutiable part of that article had not lost its identity, then the duty was payable on the compound article. There were provisions for levying duty on "goods," and imported goods, and on "articles." The "articles" which he was seeking to get within the provisions of the Act were thorium and cerium, neither of which had lost its identity; but they were both liable to duty, as they were in the schedule. The point arising on this section was the old case of doll's eyes—whether the eyes made the whole doll liable to duty. If the dutiable article was of importance as to the efficiency of the article which was imported, then the whole article was "goods" within the meaning of the Act, and was liable to duty. If the dutiable part was a mere accident, and did not form a substantial part, then, of course, other considerations would arise. Subsection 5, under which the arbitration was held, provided that, for the purpose of preventing disputes as to whether any goods were or were not chargeable with duty, the Board might from time to time issue lists defining the articles which were to be taken as falling under any of the general descriptions set out in the schedule. The schedule to the Act was treated as a general description; and it was the duty of the Board of Trade to prepare a list which should be in substitution of the schedule, which schedule should specially define the articles or goods chargeable to duty. After the list had been published, any person who complained that an article had been improperly included or excluded had a right to deliver a complaint; and his clients complained that incandescent gas-mantles had been improperly excluded from the list. The finding of the Referee in the first instance was correct; but later he altered his finding, and of this they complained. The "goods" were to be liable to duty as a whole.

The Lord Chief Justice said that if the question of inclusion or exclusion of articles was left to the learned Referee, surely his finding was conclusive.

Mr. Terrell: The Referee having put a construction on the Act and made a finding, he could state a case for the opinion of the Court. The only question was as to the construction of the Act, as the whole of the findings of fact had been accepted.

The Lord Chief Justice: Has he come to a conclusion on a point of law?

Mr. Terrell replied that he had. He first delivered a verbal judgment, which he read from notes. The parties treated that as the judgment; and as they wished to take the opinion of the Court, they asked him to sign the award. The arbitration was between the Board of Trade and the Incandescent Mantle Manufacturers' Association; and owing to a communication from the Board of Trade that some confusion had arisen as to the true construction of the award, a subsequent meeting was held, when the terms of the award were altered, which decided the one point in the case against the present appellants. Section 10 of Part 3 of the Act enacted that the value of any imported goods should be taken to be the price which an importer would give for goods if delivered freight and insurance paid. This could not mean part of the goods, but "the goods." When it came to a question of valuing the goods, the Legislature did not say that "a part of the goods" should be valued, but the "imported goods" should be valued.

Mr. Justice Green said the only matter that came before the Referee was sub-section 5 of section 1.

Mr. Terrell said when one was dealing with an Act of Parliament with a view to putting a construction on the words used, one must look at the whole Act. When the word "article" was used it meant to define the particular thing which was being imported. The schedule referred to metallic tungsten and manufactured products of metallic tungsten and compounds of thorium, cerium, and the other rare earth metals. In incandescent mantles the Referee found that the illuminating parts were thorium and cerium, and that the only question was whether the asbestos ring was to be taken into consideration.

The Lord Chief Justice: Do you say that the Board of Trade ought to define these articles by saying "incandescent gas-mantles?"

Mr. Terrell said that was what they had to do under the Act—they had to settle what the Customs had to levy duty on. The Customs could not sort how much was thorium and how much was cerium, and what the value was. If the Referee was entitled to say the question of settling the point was not for him but for an arbitration under section 10, he was shifting the duty to a tribunal before whom applicants had no right to appear. Had the Referee defined what articles should be put in the list, no question would have arisen before the Customs, unless there was a dispute as to value, as the rate of duty was fixed by Act of Parliament. The Referee was wrong in saying he would leave the question as to what duty should be levied to be settled by the tribunal to be appointed under section 10. Thorium and cerium were of no use whatever in commerce except for making incandescent mantles; and it might well be held that if these articles were brought into the country in a bottle, duty should be paid, but if in the form of mantles duty should not be paid. If incandescent mantles were intended to be included, it would have been very easy to say so. Counsel then proceeded to read the Special Case stated by the Referee, from which it appeared that the Custom authorities were not clear as to the meaning of the words proposed to be added to the list—that their view was that these words, in effect, directed that the substances were to be valued with reference to their final form; and in the opinion of the Custom authorities the question he had purported to leave open—viz., the method of valuation under section 10—was really determined and prejudged by the form of words used. The Board of Trade therefore asked for an appointment for further consideration of the words to be added to the list. A further hearing was held, when the Referee said he proposed to substitute the words "mechanical compounds of nitrates of thorium and cerium and of oxides of thorium and cerium being ingredients or forming part of mantles used for incandescent gas lighting." Appellants asked for a case to be stated as to whether the Arbitrator had power to alter his award by varying the words. The following were the questions left to the Court to answer: (1) Whether upon the findings of fact the Arbitrator should have decided that incandescent mantles *eo nomine* were articles improperly excluded from the Board of Trade list; (2) whether he should have decided that the mantles proper were articles improperly excluded from the Board of Trade list; (3) whether he should have decided that all mechanical compounds of thorium and cerium and all oxides of thorium and cerium in the form of mantles or forming part of mantles used in incandescent lighting were articles improperly excluded from the list. Counsel submitted that the

Referee, having made his award, was *functus officio*, and could not make a further award.

Sir A. COLEFAX, on behalf of the manufacturers of thorium, submitted that the Referee had gone wrong in law when he decided that he would not consider the question of value and left the goods undefined. The Customs could not say what was the value of the goods unless they knew what the dutiable articles were.

Mr. GRAY said the National Gas Council, who represented 95 p.ct. of the gas companies in this country, took up the position that the Referee was not *functus officio*, that he had power to vary the words, and that there was really no point of law for the Court to deal with.

The LORD CHIEF JUSTICE said the case arose under section 1, subsection 5, of the Act of 1921 for safeguarding industries. In pursuance of the provisions of the Act, on Oct. 18 the learned Referee was duly appointed by the Lord Chancellor, and shortly afterwards a written notice was served complaining that certain articles had been improperly excluded from the list. By that notice the Incandescent Gas-Mantle Manufacturers' Association complained that incandescent gas-mantles were excluded from the list, and they claimed a declaration accordingly that the list should be amended by including gas-mantles therein. The only question which was submitted to the Referee was whether in the appropriate list the phrase "incandescent gas-mantles" ought to be added. A long discussion appeared to have taken place, and, in the result, a case was stated for the opinion of the Court upon certain questions; the first being whether, after giving judgment on Sept. 10, he had power to alter the words which he then directed to be added to the list, or whether he was *functus officio*. Apparently on Sept. 10 he had read from a rough draft of what he described as his judgment, which contained an ambiguous passage; and on reflection he altered it. He was of opinion that the learned Referee was not *functus officio*, and that he had power to alter the words so as to give effect to his decision. The question therefore would be answered in the affirmative. As to whether he ought to state a case, the question, said his lordship, would be answered in the negative. The third question was whether, upon the findings of fact, the Referee should have decided that incandescent gas-mantles *eo nomine* were articles improperly excluded. The answer to that was "No," as it was well within the function of the Referee to include gas-mantles. The question arose under the last paragraph but one of the schedule, which included metallic tungsten and manufactured products of metallic tungsten and compounds (not including ores or minerals) of thorium, cerium, and the other rare earth metals. So far as that paragraph was concerned, it was an enumeration of the goods chargeable for duty; and the question was whether incandescent gas-mantles ought to be specifically named in a definition of compounds of thorium and cerium. For the appellants it had been argued that "compounds" meant the same thing as "compound articles" in section 1. That was not so. In order to see the meaning of "compounds" in the section to which he had just referred, it was necessary to look at the context. It meant products on the one hand and compounds on the other—in other words, the compounds of thorium and cerium or such pieces made up of thorium and cerium; they were not manufactured articles which contained thorium and cerium. But however that might be, he thought it was quite open to the Referee to refuse to include incandescent gas-mantles in the Board of Trade list. There remained some other questions; but in the view he took they really did not arise.

The other members of the Court concurred without adding anything.

Mr. GRAY said he presumed the question of costs of this application would be dealt with by the Referee.

The LORD CHIEF JUSTICE: The costs will be dealt with by the Referee.

Gas Supply to a Club.

At the Bridgend County Court, last Thursday, the Llynvi Valley Gas Company sued the Secretary and seven members of the Committee of the Nantyffyllon Constitutional Club for £28, value of gas supplied. The joint owners of the premises were also sued as third parties. The Club was recently struck off the register, owing to lack of members. The claim against the third parties was dismissed by the Judge; but he gave judgment for the Company against the Secretary, and made a declaration that such of the members as were on the Committee during the period for which the claim was made were also liable. He ordered that documents should be handed to the Court, in order that the names of the members of the Committee might be ascertained.

Gas Light and Coke Company's Special Order.—The Court of Common Council of the Corporation of the City of London, at their meeting last Thursday, authorized the County Purposes Committee to oppose the application of the Gas Light and Coke Company to the Board of Trade for a Special Order under section 10 of the Gas Regulation Act, and, if necessary, to retain Counsel, and take such other steps as might be deemed advisable.

Ellesmere's Unprofitable Gas-Works.—The failure of the gas-works as a paying proposition was fully discussed at a recent meeting of the Ellesmere Rural District Council. The Clerk said he had had no reply from the Ministry to the request that they might pay the debit balance on the gas account by instalments; so the matter was deferred until the first meeting of the new Council. On the proposition of Mr. Tims, seconded by Mr. Kesterton, the gas account was subsidized by the general district account to the extent of £100. The great amount of leakage recorded in the statement presented to the members was touched upon; but the Chairman said they could not account for it, neither could the Manager. The Manager, in reply to the Chairman, said the meters, holders, and mains were in a good condition. The amount of gas described as leakage was not as much as it appeared to be at first glance. The Chairman said some gas-works had closed-down, and others were running at a loss. He had never known the Ellesmere Gas-Works to pay; and it was in no way due to bad management.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade under the Gas Regulation Act.

Kilworth Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 3s. 8d. and 4s. 2d. per 1000 c.ft.; and the prices they have asked the Board of Trade to substitute for these are 1s. 6d. and 1s. 7·1d. per therm.

Ogley Hay and Brownhills Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

Shelley and Shepley Gas Light Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 4d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

SPECIAL ORDERS.

Beaumaris Corporation.

The Corporation intend to apply to the Board of Trade for a Special Order to empower them to supply gas and to acquire gas-works from Sir Richard H. W. Bulkeley, Bart., to erect works on land scheduled, to make provision with regard to charges, to borrow money, and to regulate the supply of gas.

Holyhead and North Wales Gas and Water Corporation, Ltd.

Application is to be made by the Company for a Special Order to enable them to erect works, &c., on land scheduled.

DECLARATIONS OF CALORIFIC POWER.

Conisbrough Gas Company, Ltd.—500 B.Th.U. (April 1.)
Knutsford Light and Water Company.—450 B.Th.U. (April 10.)
United District Gas Company.—450 B.Th.U. (June 30.)

GAS REGULATION ACT ORDERS.

There have been received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Aberdare and Aberaman Consumers' Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18·4d. per therm.

Prepayment meter clauses are included. (April 3.)

Brading Harbour District Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 19·6d. per therm.

As from the declared date, the word "therm" shall be substituted for "1000 c.ft.," wherever occurring in section 32 (limit of charge for public lamps) of the Brading Harbour District Gas Act, 1878. (April 7.)

Dorchester Gas and Coke Company, Ltd.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16·6d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged for 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one half. (April 5.)

Newport (Isle of Wight) Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (April 3.)

Rochdale Corporation.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm; and this shall be substituted for the price of 5s. per 1000 c.ft. mentioned in section LXV. (Commissioners to supply gas to dwelling-houses and shops) and section LXVIII. (limiting the price of gas) of the Rochdale Improvement Act, 1853. (April 1.)

Ballymena Gas-Works.—A large gathering of urban council representatives from various parts of the North of Ireland attended the official inauguration at the Ballymena Gas-Works of a new Glover-West vertical retort installation, erected by the local Council at a cost of £18,000. The adoption of the vertical retort system is expected to effect a saving of about £2000 a year.

Gas-Services Disturbed at Brotton.—Gas-services were disturbed materially at Brotton, in the Cleveland district of North-East Yorkshire, owing to earth tremors attributed to land subsidences caused by the great extent of iron mining. Gas and water mains were broken, street paving was dislodged, walls of buildings were cracked, and the bed of a railway line was damaged. The Brotton Gas-Works were unable to give their normal service.

RAILWAY RATES AND THE COMPANIES' PROPOSED NEW CLASSIFICATION.

Gas Plant and Gas Stoves—Representations by the Society of British Gas Industries.

The Railway Rates Advisory Committee of the Ministry of Transport, presided over by Sir Francis Gore-Browne, K.C., have been considering the new classification of goods by merchandise trains which has been proposed by the railway companies. The old railway classification (which consisted of eight classes) is to be substituted by a new classification containing twenty classes; the lowest rate being class 1, the rates rising with each class up to 20, apart from the question of exceptional rates.

During last week the Committee considered objections from various traders to the new classification the railway companies propose for particular classes of machinery. At first the general question of machinery was gone into at some length. It is proposed by the railway companies that machinery generally should be put into classes 12, 14, and 16 of the new classification. Consignments of less than 2 tons in weight are to be charged at the class 16 rate; consignments above 2 tons charged by the class 14 rates; and consignments over 5 tons at the class 12 rate. An application was made by the Traders' Co-Ordinating Committee that machinery should be differentiated and spread over a large number of classes. After careful consideration, however, the Committee decided that machinery should remain in the classes proposed by the railway companies.

Consideration was then given to particular pieces of machinery respecting which various traders complained, among whom were the Society of British Gas Industries.

Mr. HOLT (representing the Society of British Gas Industries) first asked that coal and coke breaking machinery should be placed in a lower category than the machinery classes proposed by the railway companies. He explained that the machinery was used in the open air at gas-works, or in covered sheds, and was not at all comparable with machinery which was used in enclosed works. It was generally of a rough and heavy character, and was conveyed in open trucks. The element of risk of damage was small, and there was no highly-finished or bright work about it. The weight of the machines, also, was concentrated in fairly small bulk. In the present classification these machines came into class 1, which was equivalent to class 13 of the new classification. Now the railway companies suggested that it should go into class 16, for consignments of less than 2 tons, which was an increase of three classes. It was difficult to state the weights in which this machinery travelled, because they varied a great deal, but consignments of less than 2 tons would be sent sometimes reaching 3 or 4 tons, and occasionally 5 tons. About one-half of the consignments sent would be heavy enough to bring them into class 14; but on the whole the Society believed that the existing classification would be better than the new. The prices of this machinery were very much below the prices of the general run of machinery. They were at present in a state of flux, and it was hoped to get back to pre-war costs at least by the time the new classification came into operation.

Mr. PIKE, representing the railway companies, alluded to the difficulty in differentiating between coal breaking and coal crushing and pulverizing machinery. There were a variety of machines to-day carried at the class 1 rate, He emphasized that when these machines were sent in consignments of 5 tons, or more, they would get the advantage of a lower rate than the present—namely, class 12—and, when in consignments of 2 tons, the class 14 rate. He could not imagine any coal-crushing machine which would weigh less than 2 tons.

The Committee could not see any reason for taking this machinery out of the general machinery classes.

At a later stage, Mr. HOLT dealt with coal and coke conveyor chains, which were at present in class 1, and which the railway companies proposed to put into class 18—an increase of 5 classes.

Mr. PIKE mentioned that these chains were driving chains, and he saw a difficulty in discriminating between them and other driving chains.

Mr. HOLT pointed out that they were not driving chains, but were used at gas-works for carrying buckets. There was also a suggestion as to packing; but these chains did not require packing—they travelled rolled up. The question of packing is to be dealt with later, however, and it was decided to leave it over. Mr. Holt also asked that the chains should be included in the general machinery classes; and the railway companies agreed to do this.

The question of gas-scrubbers was subsequently dealt with, which Mr. Holt said were at present in class 1. It was proposed to put them into class 16. The top weight of a gas-scrubber was usually about 9 tons, but they might get larger ones. On the whole, rather less than half of the traffic in gas-scrubbers would be charged at the rate for 5-ton consignments—say, 45 p.ct.

Mr. Pike handed to the Committee illustrations of scrubbers, in order to show that there were various kinds.

It was decided that gas-scrubbers were properly included in the general machinery classes.

Mr. SAVAGE (Messrs. Tangyes, Ltd.) made an objection with regard to "gas plant, suction, complete in parts." It was contended that, in the first place, this plant was not machinery, and should go into classes lower than 12, 14, and 16. A complete gas-engine came into those classes, but the plant with which the objection was concerned was for providing the motive power for the gas-engines. He alluded to the severe competition in respect of this plant; it was of a very rough nature.

In reply to Mr. W. A. Jepson (a member of the Committee), Mr. SAVAGE said this plant was at present in class 2, which was equivalent to the new class 16, and had to admit that under the new classification he would get an advantage, inasmuch as consignments of 2 or 5 tons would go at a rate lower than the present one. He claimed, however, that this machinery should go into classes 9, 11, and 13, according to weight.

The CHAIRMAN said the Committee did not see anything to distinguish it from other machinery in classes 12, 14, and 16.

A discussion took place with regard to gas cooking stoves, about which negotiations had already taken place between the traders and the railway companies. They could not agree, however, and the representative of a number of firms asked that gas-cookers with enamel sides and linings should be put into class 17. The classification with regard to gas-stoves, as finally decided before the Committee, was as follows:

Stoves, grates, heaters, and ranges:	
Fires:	
Polished or enamelled	Class 18
" " " (except as otherwise hereinafter provided)	" 16
Gas cooking:	
Polished or enamelled	" 18
" " " (e.o.h.p.)	" 16
Gas, other than cooking:	
Polished or enamelled	" 19
" " " (e.o.h.p.)	" 18
Oil or electric:	
Polished or enamelled	" 19
" " " (e.o.h.p.)	" 18

Note.—Stoves, grates, heaters, and ranges are only accepted as damageable goods not properly protected by packing unless in cases, crates, or in wooden frames. Timber or spars used for wooden frames to be not less than 1 in. thick and 6 in. broad; space between each bar not to be more than 6 in.

Incidentally, it may be mentioned that the new classification will not come into operation for two years.

GAS MATTERS AT STOCKTON.

Reduced Prices Agreed to.

When a recommendation that there should be an all-round reduction in gas prices was before the Stockton-on-Tees Town Council last week, Mr. Kelsall moved as an amendment that the power consumers should be placed on the same scale as the ordinary meter consumers. The advantageous scale in favour of the former was, he said, an injustice. When there had been a profit on the gas-works, the policy of the Council in the past had not been to go to the users and say: "Here are the profits we have made." It had been to go to the ratepayers, some of whom did not use gas at all, and say: "Here's a present. We will reduce your rates." This was seconded; and in reply, Alderman M'Naughton described the amendment as a "hardy annual." Never a summer passed but they lost money on the gas-works; and if it had not been for the power consumers taking a steady load all the year round during the day time, he did not know what the price of gas would now be to the domestic consumer.

The amendment was defeated by 21 votes to 10. Mr. Kelsall thereupon asked if 3s. 6d. per 1000 c.ft. for power consumers was a paying proposition; and Mr. Wilkinson replied that it was. Alderman Pickworth claimed that the reduction proposed (to 4s. 4d. to ordinary meter users in Stockton and Thornaby) was not sufficient, in view of the quality and pressure. Mr. Wilkinson retorted that Stockton stood third in the matter of price among the nine chief towns in the North of England; and there was now a good pressure. The reductions were agreed to.

In reference to the application for sanction for a further loan in respect of the expenditure upon the new horizontal retorts, the Town Clerk submitted a report. The Ministry of Health had suggested that the Gas Committee should consider the question of applying to the Board of Trade for the issue of a Special Order under section 10 of the Gas Regulation Act, giving the Council further borrowing powers consequent upon those authorized by the Provisional Order granted to the Council in 1920 being now exhausted, except with regard to the sum of £4687, in respect of which an application had previously been lodged for sanction to a loan for the provision of additional gas mains and services. The Town Clerk, in outlining the procedure which would have to be adopted in the event of an application for the issue of such an Order under the Gas Regulation Act, suggested that, if the Board's procedure was upon similar lines to that of the Ministry of Health, the Order could not be available before July, 1923.

It was decided that, in view of the uncertainty as to the extent to which the excess expenditure would be considered by the Ministry as justifiably coming under the head of capital, and in respect whereof sanction to a loan would be given, the length of time that will apparently elapse before any such sanction will be available, the substantial reduction in the price of gas, and the fact of the difference between what will have to be provided for interest and redemption and the yearly sum, if the excess expenditure is paid out of revenue, being a very small figure, if the Ministry would agree to the application already lodged being withdrawn, arrangements should be made whereby such excess sum would be paid out of revenue.

Lighting of Roa Island.—The Barrow Town Council have appointed a Sub-Committee to deal with the lighting of Roa Island, where, after 56 years, the Furness Railway Company have ceased to supply gas. The railway company have given twelve months' notice that they intend closing down the small plant at Roa Island; and there have been some negotiations which resulted in the Gas Committee of the Corporation declining to take-over the gas making plant, which Alderman A. Brown (the Chairman) said was antiquated. The Railway Company gave a final three months' notice that they could not continue the supply after March 31, because they had installed a new system of lighting for their buoys and lights in Piel Channel, and they had lost a considerable sum of money in the past year in making gas for use on Roa Island. Mr. Speakman (the General Manager of the Furness Railway Company) has agreed to continue to make gas at Roa Island, if the Corporation will bear any loss entailed.

BARRY GAS AND ELECTRICITY PROPOSALS.

Dual Supply Recommended.

Reference has been made in the "JOURNAL" on several occasions this year to consideration by the Barry Urban District Council of proposed gas-works extensions in relation to a supply of electricity in the district—a report on the subject being asked for by the Council from the firm of Sir Charles Bright and Partners (of which Mr. A. Hugh Seabrook and Col. H. W. Woodall are members). This report was duly received and discussed by the Council; and an indication of its contents is given below. The Council decided to apply for sanction to borrow the amount required for the installation of the necessary new gas plant, but to seek the opinions of various bodies before embarking upon the electricity scheme.

The conclusion to proceed with the gas-works extensions has, it may be remarked, not been arrived at without a lot of hard work on the part of Mr. Thomas E. Franklin (the Council's Gas Engineer), who has been reporting for years to his Committee and the Council upon the question of enlargement and renovation of the works. When he commenced his duties at Barry in 1908, he found not only that the various plant and machinery were inadequate in capacity, but that their condition was bad; and in due course he arrived at the conclusion that the vertical retort system of carbonization would be best suited to the needs and conditions of the undertaking. At the end of 1920, after visiting various towns where verticals are in operation, Mr. Franklin presented to his Committee a further report on the subject. This was followed by another report at the end of last year, in which he dealt with the suggested introduction of electricity, and showed the need for at any rate proceeding without unnecessary delay with the extensions at the gas-works—"both gas making and gas storage plant being inadequate, and not in good condition."

Report of Sir Charles Bright and Partners.

The instructions to Sir Charles Bright and Partners were: (1) To report on the necessity or otherwise of proceeding with the proposed extensions to the gas-works plant. (2) To report on the desirability or otherwise of the Urban District Council undertaking the supply of electricity in Barry—such report to deal with the capital outlay necessary and whether or not such a scheme would be likely to prove remunerative. (3) To report as to what would be the minimum extension of gas-works plant that would be required in the event of the electricity supply scheme being proceeded with.

Their report is to the effect: (1) That it is necessary to proceed with the proposed gas-works extensions. (2) That it is desirable for the Urban District Council to embark on an electricity supply scheme, and that with care it would prove remunerative. The point emphasized is that the capital outlay and the operating expenses must be kept as low as possible, and that this can best be effected by running the electricity supply in conjunction with the gas undertaking. (3) The estimated expenditure on the gas-works extension would be reduced by approximately £4000 if associated with the electricity supply scheme.

The three parts of the report correspond with the three items of the instructions to the firm.

THE GAS UNDERTAKING.

The carbonizing plant consists of eight settings of six retorts, on the inclined principle, and capable of making a maximum of 640,000 c.ft. of gas per day. Six of these eight settings require re-building from the bottom; while the other two need extensive repairs. Additional carbonizing plant should have been provided years ago; but presumably in Barry, as in many other places, the war intervened, and many desirable, and even necessary, works had to be held in abeyance. The position to-day is that the carbonizing plant is incapable of meeting the demands for gas in Barry; that no portion of it can be taken out of action without prejudicing the gas supply of the district; and that, even with all the plant in operation, the public are not receiving a full and proper supply of gas. In addition to the inclined settings, there is a Humphreys and Glasgow carburetted water-gas plant, capable of making 500,000 c.ft. of gas per day; but this needs thorough overhauling.

The present gasholder is seriously below capacity, and in a precarious condition structurally. Its capacity is 600,000 c.ft., while the maximum day's output in 1919 was 1,250,000 c.ft. True economy lies in building a holder of 1,500,000 c.ft. capacity at once; but before going too far with its design, it would be advisable to take very careful borings on the gas-works site. The pressure all over the district is low, and in some cases inadequate; and when the Gas Committee are in a position to increase the present output of gas, the question of putting-in a boosting plant that would ensure the maintenance of a steady and sufficient pressure in the district at all times irrespective of the pressure of the holders, would be worthy of serious consideration.

The character of the district is ideal for the supply of gas. In spite of trade depression, the increased output of gas in Barry for the last quarter of 1921 amounted to 13 million c.ft., or 18 p.ct. more than the sale for the same period in 1920.

The gas undertaking has been financially successful ever since its acquisition in 1894. During that time, it has not only paid interest on loans, but has repaid a large portion of capital invested in the undertaking, and made considerable contributions to the support of the water undertaking. The Gas Committee are now asking for an amount of £125,000, the expenditure of which will place the Council in the position of having more than double their carbonizing plant, more than double their existing storage capacity, and an up-to-date system of manufacture that will yield greatly increased makes of gas and residuals per ton of coal carbonized.

There seems to be some little anxiety in certain quarters as to the future of gas supply in Barry, particularly if electricity be installed. In Bournemouth, where the supply is almost entirely domestic, and in Cardiff, where it is largely industrial (and in both of which places there is very keen electrical competition), the output of gas doubles every ten years. In the former town, the increased output in 1920 was 9·3 p.ct. During that year, 460 new houses were built. Of these, 316 were supplied with gas only, 125 with gas and electricity, and 19 with electricity alone. The experience in America is just the same. During the period 1901 to 1920, the output of the American gas companies increased by 214·8 p.ct.; but in Baltimore, where the supply of gas, electricity, and power is in the hands of one company, the increase has been 398·7 p.ct. in nineteen years. This simply goes to prove that supplies of gas and electricity are complementary—not antagonistic—and that the extension of the use of one acts as a stimulus to the output of the other. There are many cases where electric lighting has entirely superseded gas; but the use of gas increased many times over in the same premises, owing to its utilization for other domestic and industrial services.

After inspecting the works and district, and carefully reviewing the position of the Gas Department, the firm are of opinion: (1) That the proposals in regard to increased holder capacity and carbonizing plant should be immediately put in hand, if an adequate supply of gas is to be maintained. (2) That these extensions will not involve any charge on the rates, but that, on the contrary, they will result in a material reduction in the price of gas. (3) That there is every reason to anticipate a large increase in the consumption of gas, provided—(*a*) the Gas Department have the gas available to supply, (*b*) a sufficient pressure is maintained to enable the consumers to obtain the gas they require, and (*c*) facilities are provided to enable consumers to appreciate the advantages attendant on the use of gas for various domestic and industrial purposes, and to obtain the necessary apparatus for using it.

AN ELECTRICITY SUPPLY SCHEME.

Dealing with the desirability of proceeding with an electricity supply scheme, the report points out that Barry, with its population of 40,000, is one of the largest towns in the country not provided with a supply of electricity—statutory or non-statutory. It is most probable that, if the Council do not provide a supply, powers will be sought by, and granted to, a company to do so, as the Government, who have appointed Special Commissioners to develop the electricity supply industry, will hardly refuse an application from responsible people in regard to a town of such importance. As the gas and water undertakings already belong to the Council, it appears particularly appropriate that the Council should, by undertaking the supply of electricity, assume responsibility within their area for all the public services.

It is undoubtedly a fact that Electricity Orders are frequently obtained, and worked, by local authorities and by companies when the most casual examination of the area and scheme proposed should show that it cannot possibly prove remunerative. A glance through the accounts of numerous undertakings shows that they are not successful, and suggests that this want of success might have been foreseen. Probably the most common cause of financial failure is that the district is too small to support an independent electricity undertaking; whereas, had it been linked-up with a kindred undertaking—such as a gas-works—financial success would have been secured. The running, as well as the overhead, charges of a combined gas and electricity undertaking can unquestionably be largely reduced as compared with the expense of running two separate and distinct concerns.

Some of the savings are obvious to any business man—for example, meter readings and consumers' accounts, which can all be done by the present meter readers and clerks with comparatively slight increase in the time spent. Again, it is practicable, and obviously more economical and more convenient, to have one chief official instead of two. Also, under one chief, comparatively slight additions of technical men to the existing gas-works staff and labour will provide for running the electricity generating plant and keeping it in repair. A most important factor of cost is that of plant, and the more closely it is associated with the gas-works, the greater is the saving in this direction. There are other minor savings not unimportant in the aggregate—such as correspondence and office staff, and the accommodation of same, purchasing of materials and storekeeping, all tending to economy in labour, buildings, and space. The firm have approached the problem of electricity supply in Barry on the assumption that the town desires such a scheme, providing that it shall not involve a charge on the rates. From a careful examination of the district, they are of the opinion that even a separate electricity undertaking installed in Barry would prove a financial success, provided it was commenced in a modest way, and great care exercised to keep both capital and operating expenses down to the lowest figure compatible with efficiency.

In the scheme which is outlined in the report, the firm do not advise cables for street lighting, because as both undertakings would belong to the Council they see no particular object in changing from gas to electric lamps. There would be no advantage in cost; and, as regards candle power, either illuminant can be made to equal the other, provided that the same expenditure be incurred. In street lighting, electricity has not the advantage as regards easy switching that it has for interior lighting, except at prohibitive cable cost. Also in street lighting the other advantage of electric light for interior purposes—viz., saving in decorative expense—does not, of course, apply.

The report is based on the assumption of combination with the gas undertaking—that is, not merely an electricity works on the gas-works site, but actually situated inside the gas-works, and worked so that the best use can be made of existing buildings, staff, repair shops, fuel, and labour. There is in existence an old retort-house of ample dimensions to house the electricity generating plant, and still leave room for extensions; and it will probably be found that the old foundations can also be utilized, so saving an expenditure of several thousand pounds. The generating sets would consist of medium-speed horizontal gas-engines, direct coupled to continuous current electric generators of the three-wire type. Such gas-engines could be driven from either coke producer or town gas. Outside the engine-room would be one coke-fired gas-producer of 250 H.P. capacity.

It is, the reporters say, perhaps worth mentioning that, in the gas plant extension, provision had wisely been made for an electric generating plant for producing light and power for gas-works purposes. This is now standard practice, and results in economy; but the firm point out that the electric generating plant they advised for supplying the town, though larger than that for the gas-works would have been, will require practically no more attendance or repairs than the smaller plant. This is one more illustration of the comparatively small additional cost to the gas undertaking in combining with it an electricity

supply business. The only saving in respect of the cost of gas-works extensions that would be effected by the installation of an electricity supply scheme would be about £4000 for electricity generating plant for the gas-making machinery, which would not be required.

The firm do not consider that the introduction of electric light into Barry would result in any diminution of the demand for gas, because it is invariably found that, when the two illuminants are available, the standard of illumination in the district is raised, causing a gradually increasing demand for light; and they do not anticipate that the introduction of electricity will have any appreciable effect on the use of gas for cooking and heating purposes. They have noticed that, with the exception of the docks (where there is already a supply of electricity available), there is likely to be only a small demand for power.

AUSTRALIAN GAS LIGHT COMPANY.

Remarkable Progress.

The Half-Yearly Meeting of the Company was held in the Company's Lecture Hall, Haymarket, Sydney, on Feb. 14—Mr. George J. Cohen (the Chairman) presiding.

The Secretary (Mr. C. U. B. Gurnett, A.C.I.S.) submitted the report of the Directors and presented the audited accounts.

The Chairman, in moving the adoption of the report, said he might, in the first place, extend to the shareholders a hearty welcome to the new showroom and lecture hall. These premises, which formed part of the scheme of alterations adopted some time back, would be linked-up with the new public office (the construction of which was also well advanced) for the payment of accounts, &c. The Company purchased the first block of land at the Haymarket station in 1854; but as the business of the Company had so increased, it was found necessary to purchase an additional area, upon which the first gasholder was erected and put into action in the year 1859. In 1861, however, a second holder was erected. At that time gas was 15s. per 1000 c.ft. Later the two small holders and cast-iron tanks were removed to make room for one of a much larger capacity. This latter holder was completed in 1879, having taken three years to erect. Its capacity was 580,000 c.ft. The present holding capacity was:

Mortlake	No. 1 holder	2,500,000 c.ft.
	No. 2 ,,	3,500,000 ,,
	No. 3 ,,	12,000,000 ,,
Rushcutter's Bay		750,000 ,,
Total capacity		18,750,000 c.ft.

Owing to the rapid growth of the Company's business and the resumption of the Company's head office at Kent Street, the Board, after mature consideration, decided to utilize the Haymarket site for central offices. Perhaps the following comparisons showing the progress of the Company since 1879 might also be of interest:

	1879.	1921.
Gas sold . . . . . C.Ft.	286,894,000	5,174,103,000
Number of consumers	8,280	166,831
Capital (share, loan, and premium) .	£250,000	£3,859,467
Coal carbonized (coal and oil) . Tons	30,000	467,326
Revenue	£111,991	£1,634,886

The percentage increase in gas consumption had not been up to the figure of previous periods; 1·34 p.ct. being the increase over the corresponding period of the previous year. The total amount sold during the period covered by the report was 2,734,617,000 c.ft.; while the gas consumers now numbered 166,831, showing a net increase of 3707. It was, of course, not anticipated that there would be a continuance of past increases—particularly in view of the cost of living conditions, and general industrial and commercial unrest. There had been a decided tendency on the part of consumers to economize in the use of gas. There were 5789 public lights in use, showing a decrease of 1007. This reduction was due to the adoption of electric light by some of the municipal councils whose contracts with the Company had expired. The programme of extensions to the works at Mortlake was proceeding satisfactorily, good progress having been made with the erection of No. 5 vertical retort-house and its attendant plant. Additional water-gas plants had been completed, as also had the new wharf, cranes, and transporting plant for the receipt of coal. The reconstruction of No. 1 retort-house approached completion. Already one-half of this house had been in commission and working satisfactorily for some months. The net revenue for residuals showed a falling-off in comparison with the figures for the corresponding period. As a matter of fact, the only decrease was in regard to sulphate of ammonia, which had, of course, been subject to the variations in market conditions. These Kent Street works were formally handed over to the Sydney Harbour Trust on Sept. 30, so that the whole of the Company's manufacturing operations were now being carried on at Mortlake. In view of the urgent need of additional capital to meet the cost of extensions to provide for the ever-increasing demands for gas, the Directors decided to place on the market new "C" debentures to the amount of £450,000, having a five years' currency from Dec. 1, 1921, and bearing interest at the rate of 7½ p.ct. per annum. The whole of the issue was taken up. In view of reduced material costs, together with savings effected by the centralization of manufacture at Mortlake, and taking into consideration the reduction in wages, the Directors were considering the question of reducing the price of gas. This desirable step must, however, be deferred until after, and must be entirely regulated by, any decision which might be reached in regard to the introduction of a 44-hour working week among the Company's men.

The report was unanimously adopted.

A unanimous vote of thanks was accorded the Directors and officers for their efficient management of the Company's business during the past half year.

LUTON GAS COMPANY AND THE PHILLIPS FAMILY.

At the 128th ordinary meeting of the proprietors of the Luton Gas Company last week (Mr. R. S. Tomson, J.P., presiding), reference was made to the death of Mr. William Richards Phillips, who had been connected with the Company for upwards of 45 years, for 32 of which he held, with great devotion and ability, the position of General Manager, Engineer, and Secretary. The Directors felt that the success of the Company was largely due to his untiring efforts. They appointed Mr. William Phillips to succeed his father, to whom he had acted as Chief Assistant for some 27 years.

The Chairman, in submitting the report and balance-sheet, referred to the late Mr. Phillips, and said he died at a grand old age, only two days after he was last at the works. He was for many years General Manager, and before that was assistant to his father, whom he followed in that position. Now he, in turn, had been succeeded by his son, who had a good knowledge of the works and of all the business of the Company. The Chairman congratulated the Company on having got through a very trying period of negotiation, as a result of which they had been granted an Order under the Gas Regulation Act. With regard to the balance-sheet, he drew attention to the fact that coal cost £117,323, against £97,944 in 1920. The increase in the gas-rental for public and private lighting was just about equivalent—from £96,000 to £116,000. It was considered that the extra cost to the Company through using foreign coal was not less than £11,000. Receipts from bye-products were down by £7000, to just under £61,000.

The report and balance-sheet were adopted.

Mr. George Warren, J.P., said it was a pleasure to see Mr. William Phillips following in the footsteps of his father; and it was to be hoped he would fill the position of General Manager as long as his father.

Mr. J. A. Burgess, J.P., also said it was pleasant to see the son of their "grand old townsman" coming along to take his father's place.

Mr. Phillips explained the new system of charging, and expressed his sincere thanks for the kind things which had been said about his family.

TRADE NOTES.

Stanton Hume Concrete Pipes.

A long list of principal users, which is being circulated by the Stanton Ironworks Company, Ltd., near Nottingham, shows that a large measure of popularity has been secured by the Stanton Hume reinforced concrete pipe. The names of many important undertakings are included; and in numerous instances the lengths of pipes ordered are very extensive. There are also various repeat orders indicated in the list.

The Barimar Process.

Barimar, Ltd., of No. 10, Poland Street, Oxford Street, London, W.1, announce that they are now granting licences to responsible engineering companies, founders, &c., to operate the Barimar metallurgical (patented) process for recovering scrapped castings in their own shops. Scored cylinders will still be treated by Barimar, Ltd., at No. 10, Poland Street, London, and at the various Barimar branches in the United Kingdom.

A Fatal Gas-Oven Explosion.

Theories as to the cause of a regrettable accident which resulted in the death of a Luton man at a well-known engineering works in that town, were advanced at the inquest by Mr. William Phillips (the Engineer, Manager, and Secretary of the Luton Gas Company). The man who customarily lighted the gas-oven attempted to do so on the morning in question, when there was a loud explosion and one-half of the oven-door (weighing 1½ cwt.) was blown off and struck the man, who subsequently died in hospital. Mr. Phillips said that a telephone message was received that there was a fluctuation in the gas supply at the works of Messrs. George Kent, Ltd. At the request of this Company, the syphons were pumped; but there was no water in them. This led to the meter being tested at the works; and it was found to fluctuate considerably in pressure. The meter was tested again at the Gas Company's works under similar conditions; and there was the same result. Curiously enough, he could not get the meter absolutely to shut off the gas. In his 32 years' experience, he had never had it brought to his knowledge that an oven of this type had been stopped working through a temporary stoppage of the gas in the meter. The meter in question was new in 1917, when it was fixed in the works. He had the top of the meter cut off, and then he discovered a mechanical defect. One of the levers which connected-up the valves had become disconnected; but there was nothing to show why and how this had occurred. The result was to cause one side of the meter to be jammed, which would bring about a temporary cessation of the gas pressure. It would have been quite impossible to locate this defect without taking the meter to pieces; and an ordinary inspector could not have detected it. It was a most unusual happening. The meter was working under its power. Mr. Phillips emphasized that the mechanically defective meter was not the cause of the explosion. Had a match not been struck, the explosion would not have occurred. The Jury brought in a verdict of "Accidental death."

The Sutherland Meter Company.—The Sutherland Meter Company have recently issued their balance-sheet for the year ended Dec. 31 last; and the figures show a notable advance on those of the previous year. The Directors are putting forward proposals to their shareholders for the purpose of writing-off a large item for goodwill by a reduction of the capital, which will further strengthen the position. We are informed by the Company that there is no question as to the financial position, and the Company are apparently making satisfactory progress.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 10.

There is little of interest to report in the London tar products market. Pitch remains steady, although there is a temporary lull in business. Makers, however, are well sold already, and in any case have only very small balances available for sale for this season. The value of ordinary London creosote is put at 6d. net per gallon in bulk at makers' works.

Sulphate of ammonia remains in good demand, both for home and export; stocks being extremely low.

Tar Products in the Provinces.

April 10.

The average values for gas-works products during last week were: Gas-works coal tar, 35s. to 40s. Pitch, East Coast, 72s. 6d. to 75s. f.o.b. West Coast—Manchester, 67s. 6d. to 70s.; Liverpool, 67s. 6d. to 70s.; Clyde, 70s. to 72s. 6d. Benzole 90 p.ct. North, 2s. 1d. to 2s. 2d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 1d. to 2s. 2d. Toluole, naked, North, 2s. 2d. to 2s. 5d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4¼d. to 4½d.; salty, 3⅝d. to 4¼d. Scotland, 3¾d. to 4d. Heavy oils, in bulk, North, 6d. to 6⅝d. Carbolic acid, 60 p.ct., 1s. 10d. to 2s. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

The tar products market has experienced but small business since my last report. Nevertheless, prices remain about the same. The coal strike in America has not yet affected the English market; but it may have some influence if prolonged. There is little movement in pitch; but if anything prices are weaker at from 67s. 6d. to 72s. 6d. Holders are apparently relying upon a demand which is to come from roadmaking and repairing. Solvent naphtha has not improved, and is now quoted at 2s. 1d. per gallon. Naphthalenes are off colour. Refined keeps to the low figure of £15 to £17 per ton, and crude on only a small demand from the firelighter industry at £5 per ton. There is no definite change in the position of carbolic acid. Makers of crystal continue to quote 5½d. per lb., and to do this they need to buy their crude 60's at under 1s. 6d. per gallon; but makers maintain that it is impossible to produce it at that figure. Cresylic acid is 2s. on rail for pale 97-99 p.ct., and dark 95-97 1s. 10d. per gallon. Benzole remains quiet at 2s. 3d.; but some improvement may be looked for with the bettering of the weather, which will bring about an increased demand from the motor trade. Creosote is steady and slightly more active at about 5d. per gallon. In intermediate products, there is only a small amount of business passing; but there are distinct signs of improvement. Prices have been unchanged since my last report.

Sulphate of Ammonia.

The shortage of sulphate of ammonia continues; and in view of the fact that the majority of the coke-ovens are still closed down, it is difficult to see how farmers' final demands for the current season are to be met without importing. An appeal has been made to gas undertakings to increase production; but with the period of low consumption of gas approaching, such an increased output is hardly feasible, and would be unremunerative to the companies. The present position is somewhat unprecedented in the history of the sulphate of ammonia trade, as this country is usually a very large exporter of the material. Should current conditions continue, we may look for increased prices after the end of May. The position in America, according to recent advices, is similar to that obtaining here, and prices continue high. Despite these conditions, however, transactions for large tonnage continue to be noted, particularly for export purposes, most of which has been taken for shipment to European countries. While inquiries are still appearing in the American market from the Far East, there has been some easing-off in the volume of transactions to these ports. Japan, which has been one of the most important buyers, was able to obtain a fair quantity of material when the market was at a comparatively low level. There is still a considerable amount of business that could be done for both home consumption and export purposes at a price; but stocks of any consequence are difficult to find. The material that is available is held by re-sellers, who have continually advanced their prices, and who seem still to be in a strong position, since producers are out of the market for immediate and near deliveries in most cases for four or five months ahead.

Promoting Demand at Birstall.—Despite a difficult year's working, and a loss to the Department, the Birstall Urban District Council Gas Department have reduced the price of gas 5d. per 1000 c.ft. all round, in the hope that the concession will create a greater demand.

Gas Profits and the Rates at Darlington.—It was reported to the Darlington Town Council last Thursday that there had been an increase of 2·61 p.ct. over the preceding year in the quantity of gas manufactured. The Gas Committee recommended that an estimated net profit of £2499 should be placed to the reserve account, and that the price of gas charged to all consumers should be reduced by 4d. per 1000 c.ft. from the present reading of the meters. Mr. Dixon, however, in moving the adoption of the minutes, said the Committee had agreed to give £2000 of the profits to the relief of rates, instead of putting £2499 to the reserve fund, as previously decided.

Rents Revised and Prices Reduced at Croydon.

For several years past the cost to the Croydon Gas Company in respect of meters rented by consumers has largely exceeded the sums paid as rent; and this excess results in the price of gas having to be higher than would be the case if meter-rents were more equitably adjusted. The Directors have therefore decided that after Midsummer next the rate of hire of meters shall be revised. The amount the Company will gain through this change is equal to rather less than ½d. per therm in the price of gas; but a reduction of this amount will be made in the price. The Directors have decided to make a further reduction, from the Midsummer quarter, of ¾d. per therm, in addition to the reduction which is being made with effect from Lady Day. This will make the price in the Croydon district 12d., and in the Caterham district 12⅝d. per therm.

Lower Prices at Blackpool.—The Blackpool Gas Committee have decided upon the following reductions in price: Power purposes, from 4½d. to 3¾d. per 100 c.ft.; ordinary meters, from 5d. to 4½d. per 100 c.ft.; prepayment meters, quantity supplied to increase from 18 to 21 c.ft. for a penny.

Belfast Gas Official Murdered.—Reference was made by Mr. M'Laurin, at a meeting of the Belfast Corporation, to the killing during the recent shootings in the city of one of the Gas Committee's most efficient collectors, Mr. Campbell, who, he mentioned, was on the eve of promotion to the clerical staff under a reorganization scheme. They all deeply deplored his death, and tendered the utmost sympathy to Mrs. Campbell, her family, and friends. The Council endorsed the Councillor's motion conveying the condolences.

Cost of Gas Supplies to Housing Schemes.—Alderman G. Lupton (Chairman of the Improvements Committee) reported to the Leeds City Council last week that, as a result of a recent conference with representatives of the City Council, the Ministry of Health had agreed to make an allowance of £12,000 approximately, as part contribution towards the cost of gas services and supply to nearly 3000 houses on the Crossgates and Middleton housing estates. The Gas Committee and his own Committee, he said, were quite satisfied with this offer; and the gas was to be supplied at once.

Price Reduced at Neath.—At a meeting of the Neath Town Council last Thursday, the Gas Manager (Mr. W. C. Jackson) reported that he had gone into the costs of production; and in view of the reduction in wages, &c., he recommended a reduction in the price of gas of 6d. per 1000 c.ft. as from April 1, instead of waiting for the introduction of the therm system on June 1. In reply to questions, Mr. Jackson said this would mean a reduction of about £3000 per annum in the revenue of the undertaking. Prepayment consumers would get 12 c.ft. of gas for a penny, instead of 11 c.ft. The recommendation was adopted.

Swansea Gas Light Company's Allotments.—Letters of allotment and regret in respect of the recent issue of redeemable debenture and preference stocks of the Swansea Gas Light Company were posted last Monday. Owing to the overwhelming subscription (the £200,000 of 6½ p.ct. debenture stock having been over-subscribed to the extent of more than £4,500,000, and the £250,000 of 7 p.ct. preference stock to the extent of over £2,000,000), we are informed that allotments are bound to be disappointing. Existing stockholders, however, have received approximately 40 p.ct. and 50 p ct. of their applications as regards the debenture and preference stocks respectively.

Manchester Gas Price Reduction.—The proposed reduction of 4d. per 1000 c.ft. in the price of gas was approved by the Manchester City Council at their meeting last Wednesday. An amendment was moved by Mr. H. Weate to abolish the preferential terms conceded to large consumers of gas for manufacturing and power purposes. He argued that the reduction would make no appreciable difference to the small household consumer; but the large consumer would enjoy very considerable benefit. Mr. W. Cundiff said that next September the Committee would see if they could not make a further reduction. The large consumers were worth encouraging, from the point of view of making the undertaking pay. The amendment was lost.

Belfast Electricity Deficit.—During a discussion in the Belfast Corporation on proposed reductions in electricity charges, Mr. Alexander referred to "the wild and extravagant expenditure, and the unbusinesslike arrangements which had brought the electricity undertaking to a disastrous position." With a station costing £2,000,000, and contracts involving a loss of £51,000 a year for ten years, they could hardly expect to have cheap electricity. Mr. Boyd said no justification had been given for a reduction of charges; and if further expense was involved, the ratepayers as a whole would have to bear their share of any deficit that might occur. Mr. O. Jamison said that, for the year ended March 31 last, they were faced with a deficit of £38,015; but he calculated on a net surplus of £21,430 in the coming year. The proposals were approved.

Price of Gas at Barrow.—The Gas Committee reported to the Barrow Town Council last week that they had considered a statement by the Borough Treasurer with regard to the financial result of the working of the gas undertaking; and they recommended that the price of gas be reduced 9d. per 1000 c.ft. from the beginning of April—the question of a further reduction to be considered six months hence. Councillor Archer moved an amendment that the reduction be 1s. He saw that on the first six months of the year there was a profit of £700, while on the third quarter there was a profit of £4000. With the reduction in wages and in the cost of coal, they ought to give the consumers greater benefit. Alderman A. Brown (the Chairman of the Gas Committee) said he could not accept the amendment. The Committee had first recommended a reduction of 6d. per 1000 c.ft.; but they compromised at a General Purposes Committee meeting, when a 1s. reduction was proposed, and they agreed to 9d. The return for the third quarter did show an improvement on the first two quarters of the year; but the accounts for the full year had not yet been completed. The amendment was defeated. Councillor Morton then moved a further amendment which provided for the price of gas being considered, if necessary, at any time earlier than proposed; and Alderman Brown said he would be quite agreeable to this.

A Leeds Smoke Abatement Campaign.—A real step has been taken in Leeds towards dealing with the smoke problem, by the establishment of a Smoke Abatement Committee, comprising the Health Committee, with representatives of the Gas and Electricity Departments, and, it is hoped, business and manufacturing people who are to be co-opted. The first meeting was held on the 6th inst., under the chairmanship of Dr. C. H. Moorhouse, when a plan of campaign was considered, both as to industrial and domestic smoke. In view of the coming of summer, it was felt this was not the best time to take public action; but a small Committee were appointed to prepare for a series of lectures and other forms of publicity, to start next autumn. For firemen and stokers of industrial works, it was decided to have a course in fuel economy and fuel chemistry, with certificates at the end. The public side of the question, it was decided, should be dealt with by general propaganda and meetings and through trade unions, urging the public to use gas-fires.

Nottingham Gas-Workers.—Important questions affecting different Trade Unions having, our local correspondent writes, arisen in Nottingham regarding the grading of meter and stove workers in the service of the Corporation, a protracted conference for the consideration of the points involved took place on Friday, when the Gas Committee were interviewed, on behalf of the men, by a deputation from the National Union of General Workers, including Mr. Will Thorne, M.P. (General Secretary), and Mr. A. Hayday, M.P. (Midland Secretary). It was decided to refer the matter to the Joint Industrial Council for the Gas Industry, which meets on Wednesday, and of which Mr. Hayday is one of the Joint Secretaries representing the men. A conference was also held in Nottingham on Thursday of the East Midland Area Council, which governs the rates of pay and labour conditions of manual workers employed by local authorities, when it was determined that lamplighters' wages should be reduced by 7½ p.c., bringing wages down from 56s. to 51s. 9d. per week.

STOCK MARKET REPORT.

THE happy state of the Stock Exchange a week ago was fully maintained. Rising markets and increasing activity of business combined to impart refreshing cheerfulness. Home Government issues were well to the front in this respect; the big four achieving record prices, and their Friday figures showing thus: Consols 57⅜-58¼, War Loan 99⅜-99 1/16, Funding 85-85⅜, Victory 89⅞-90 5/16.

Business in the Gas Market was bright and cheerful, and the upward march of quotations still in active progress. In the London Companies, Gas Light ordinary rose 6, ditto preference 1, and debenture 1¼, South Metropolitan 1, ditto preference and debenture 2 each, and Commercial 1. In Suburban and Provincial, Alliance and Dublin rose 15, Brighton and Hove "A" 7½, Ilford debenture 5, Lea Bridge 3, Newcastle debenture 1½, Sheffield "A," "B," and "C" 4 each, South Shields 2, South Suburban 2, Tottenham "A" 7½, ditto "B" 3, and Wandsworth "C" 2. In the Continental group, Union rose 1, and ditto preference 2, European 1¼, and Malta and Mediterranean ½. Imperial fell back; but the debenture rose 5. Primitivas were unchanged.

Bargains done for cash during the week were as follows: On Monday, European 9¼, Gas Light ordinary 80½, 80⅝, 80¾, 81, 81¼, 81½, 81¾, 82, ditto maximum 59¼, 60, 60½, ditto preference 76, Imperial Continental 158, 158¼, 159¼, 160, Primitiva preference 53s. 9d., 55s. 7½d., South Metropolitan 86, 86⅛, South Suburban 92, Danish 4 p.ct. debenture 53. On Tuesday, Bombay 4, Croydon "B" and "C" 150, Gas Light ordinary 81½, 82, 82¼, 82½, 82⅝, 83, 83¼, 83⅜, 84, 84¼, 85, ditto preference 76¼, ditto debenture 57½, Imperial Continental 158, 159½, Oriental 84½, 85¼, 85½, Primitiva preference 55s., South Metropolitan 86¼, Tottenham debenture 72, Wandsworth Wimbledon 68, 68½, ditto 4 p.ct. debenture 66, Liverpool 7 p.ct. preference 104, 105, ditto £65 paid 69. On Wednesday, Bournemouth 3 p.ct. debenture 50, Commercial 4 p.ct. 84¼, European 10, Gas Light ordinary 83⅜, 84, 84⅛, 84¼, 84½, 84⅝, 85, ditto preference 76½, 77, 77¼, 77½, Imperial Continental 156⅝, 157, 157¼, 157½, 157⅝, 158, 158½, 159, 159½, Lea Bridge 86, 87, Oriental 84⅜, 85¼, Primitiva 15s., 16s., ditto preference 53s. 9d., South Metropolitan 86½, Wandsworth Epsom 66, Croydon 7½ p.ct. preference 100, 100½, Liverpool 7 p.ct. preference £65 paid 69⅜. On Thursday, Bournemouth 3 p.ct. debenture 54 9/16, Gas Light ordinary 84½, 84⅝, 84 13/16, 85, 85¼, 85⅛, 85⅜, ditto preference 77⅜, 78, 78⅛, Imperial Continental 156½, 157, 158, 158¼, 159, Newcastle 72, ditto debenture 66, Primitiva 16s., South Metropolitan 86⅜, 87⅜, South Suburban 92½, 94, Lea Bridge 7 p.ct. debenture 102½, Liverpool 7 p.ct. preference 104½, 105, ditto £65 paid 70, 70½, Woking 10 p.ct. "A" 61½, 62, Southgate 7 p.ct. maximum 108. On Friday, Brighton and Hove "A" 115, 117, Commercial 4 p.ct. 84½, 85¼, 85½, ditto debenture 55, Continental Union preference 37, European 10⅜, Gas Light ordinary 85¼, 85½, 85⅝, 86, 86¼, ditto preference 77½, 77⅝, Imperial Continental 157½, 158½, 158¾, 159½, 160, Lea Bridge 87, Metropolitan of Melbourne 96, Oriental 86, Primitiva preference 53s., 53s. 9d., 54s. 4½d., South Metropolitan 86, 87, ditto preference 97, ditto 6½ p.ct. debenture 104, South Suburban 93, 94, Tottenham "B" 87½, Aldershot "C" 76½, 77, Barnet "D" 72, Croydon "D" 68, Liverpool 7 p.ct. preference £65 paid 70½, Southgate 107½, 108, Walton and Weybridge "B" 8⅝, 8¾.

In the Money Market, very easy conditions lasted till the close. Discount rates were easy. Silver varied but slightly, opening and closing at 33¾. The Bank rate is 4½ p.ct., as fixed on Feb. 16.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mch. 15	4	4%	Aldershot 4 p.c. Pref.	..	65—70	...
1,551,868	,,	Oct. 13	2½	3 1/16%	Alliance & Dublin Ord.	59—64	60—65	...
374,000	,,	Jan. 12	4	4%	do. 4 p.c. Deb.	76—79	55—60	...
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd.	5⅛—6⅛	3¾—4¼	4
100,000	5	Feb. 23	16	7½%	Bourne- { 5 p.c.	..	9—10	...
383,110	10	,,	7	7%	mouth Gas { B 7 p.c.	15—15½	8½—9	...
115,000	10	,,	6	6%	and Water { Pref. 6 p.c.	13½—14	7½—8	...
162,065	—	Dec. 30	—	4%	{ 4 p.c. Deb.	..	65—70	...
992,045	Stk.	Feb. 9	14	56/-	Brentford A Consolid.	261—266	87—92	...
734,920	,,	,,	11	55/-	Do. B New	204—209	87—92	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	80—85	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	68—72	...
214,775	,,	Mch. 15	11	11½%	Brighton & Hove Orig.	208—213	154—159	...
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	110—120	115—117
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	..	...
530,000	20	Mch. 15	12½	10%	British	44—45	27—29	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—72	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	52—57	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1⅜—2⅛	6—7	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	5—6	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	Mch. 15	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	82—87	84¼—85¼
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	81—86	...
475,000	,,	—	3	3%	Do. 3 p.c. Deb. Stk.	69¼—71½	53—58	55
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	19—21	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	35—40	37
51,600	,,	Feb. 23	15	15%	Croydon A 10 p.c.	..	185—195	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	..	145—155	150
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd.	17½—18	10½—10⅝	9⅝—10⅛
16,298,975	Stk.	Feb. 23	4/17/4	46/8	Gas { 4 p.c. Ord.	98—102	84½—86½	80½—86½
2,600,000	,,	,,	3½	35/-	Light { 3½ p.c. max.	76—79	59—62	59½—60½
4,962,235	,,	,,	4	4%	and { 4 p.c. Con. Pref.	96—99	75—80	76—78½
4,674,850	,,	Dec. 15	3	3%	Coke { 3 p.c. Con. Deb.	72½—74½	55—60	57½
130,000	,,	Dec. 11	10	10%	{ 10 p.c. Bonds	..	..	...
82,500	,,	Sept. 14	5	3½%	Hastings & St. L. 5 p.c.	..	..	...
258,740	,,	Mch. 15	3½	2½%	Do. 3½ p.c.	87—89	45—55	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16⅛—16½	5½—6½	...
86,600	Stk.	Mch. 15	9	9½%	Hornsey 7 p.c.	..	100—105	...
131,000	,,	,,	7½	7½%	Ilford A and C	151—154	110—120	...
65,780	,,	,,	6½	5½%	Do. B.	115—118	96—101	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	65—70	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	150—160	156—161	...
404,800	,,	Feb. 9	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	72—77	...
235,242	,,	Mch. 15	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	83—88	86—87
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	..	...
					{ B.	146—148	..	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	...
165,736	,,	Feb. 23	7/5/6	6%	Maidstone 5 p.c.	..	53—55	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb	..	43—46	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4⅛—4⅜	2¼—2½	...
250,000	100	Apl. 3	4½	4½%	Met. of { 4½ p.c. Deb.	99—101	91—98*	96
					Melbourne {			
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11½—12	58—63	...
1,875,892	,,	Feb. 23	4½	4½%	Newcastle & Gatsh'dCon.	98½—99½	71—73	72
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	65—67	66
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	12½—13	...
55,940	10	Mch. 15	7/14/0	10/1⅝	,, ,, 7 p.c.	14—15	8½—9½	...
300,000	Stk.	Dec. 15	8	8%	Oriental, Ltd.	117—122	84—87	84¼—86
60,000	5	—	10	—	Ottoman, Ltd.	7½—7⅞	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonh'se 5 p.c.	..	69—71	...
60,000	50	Mch. 15	13	62/6	Portsea Island, B	128—131	87—90	...
100,000	50	,,	12	57/6	Do. C	118—121	78—83	...
249,980	5	—	8	—	Primitiva Ord.	5½—6	¾—1	15/—16/-
499,960	5	—	5	—	Do. 5 p.c. Pref.	4⅛—5	2¼—2½	53/9—55/7½
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	70—75	...
600,000	Stk.	Jan. 26	4	4%	Do. ,, ,, 1911	..	52—57	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	52—57	...
150,000	10	Mch. 30	4	6/-	San Paulo { 6 p.c. Pref.	10½—11	5¼—6¼*	...
125,000	50	Jan. 3	5	5%	{ 5 p.c. Deb.	47—49	36—39	...
135,000	Stk.	Mch. 15	10	5%	Sheffield A	223—224	79—81	...
209,984	,,	,,	10	5%	Do. B	222—224	79—81	...
523,500	,,	,,	10	5%	Do. C	220—222	79—81	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Oct. 28	9	8%	South African	10½—11⅛	7—9	...
6,609,895	Stk.	Feb. 9	5/4/0	5%	South Met. Ord.	111—113	86—88	86—87⅛
250,000	,,	Jan. 12	—	5%	Do. Red. Pref.	..	96—98	97
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	55—60	...
224,820	,,	Feb. 23	8½	8½%	South Shields Con. Stk.	157—159	106—108	...
1,087,795	,,	,,	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	91—96	92—94
368,837	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	78—83	...
647,740	,,	Nov. 16	5	4%	Southampton Ord.	99—102	61—64	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	60—62	...
120,000	,,	Feb. 23	—	7½%	Tottenham { A 5 p.c.	135—138	95—100	...
782,275	,,	,,	6	5½%	District { B 3½ p.c.	115—117	85—90	87½
181,255	,,	Dec. 15	4	4%	{ 4 p.c. Deb.	87—89	68—72	72
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mch. 15	5	3½%	Tynemouth 5 p.c. max.	108½—109	68—70	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mch. 15	8½	66/3	Wandsworth A 5 p.c.	151—156	82—84	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	66—69	...
108,075	,,	,,	—	46/4½	Do. C.	..	65—68	66
140,865	,,	,,	—	46/4½	New Ordinary	..	63—66	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	63—66	68—68½
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	63—66	...
88,416	,,	Dec. 30	3	3%	3 p.c. Deb. Stk.	66—69	50—53	...

* Ex Div.

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COUNTY BOROUGH OF CROYDON.

APPOINTMENT OF INDUSTRIAL CHEMIST AND GAS EXAMINER.

THE Council invite Applications for the Position of INDUSTRIAL CHEMIST and GAS EXAMINER. The person appointed, who must have a good knowledge of Physics and Chemistry, will be required to Test the Calorific Power, Purity, and Pressure of Gas, and also the Calorific Value of Coal, and perform such other duties as the Council may require.
The Salary will be £450 per Annum; and the person appointed will be required to devote his whole time to the duties of the office.
The appointment will be during the pleasure of the Council, subject to One Month's notice on either side.
Applications, stating Age, Qualifications, and Experience, and accompanied by *copies* of Three recent Testimonials, must be sent to the undersigned not later than Monday, April 24 inst.
JOHN M. NEWNHAM, Town Clerk.
Town Hall, Croydon, April 5, 1922.

BOROUGH OF CHELMSFORD.

(BOROUGH ACCOUNTANT'S DEPARTMENT.)

APPLICATIONS are invited for the Position of THIRD ASSISTANT in the Borough Accountant's Department at a commencing Salary of £130 per Annum (no Bonus).
Candidates should have had previous Experience in the Finance Department of a Local Authority and particularly in the keeping of the accounts of a Gas or similar undertaking.
Applications, in candidate's own handwriting, stating Age, Experience, and Qualifications, together with *copies* of Two recent Testimonials, to be sent to the undersigned not later than Wednesday, April 26, 1922.
J. PATRICK, Borough Accountant.
Borough Accountant's Office, Chelmsford, April 6, 1922.

COUNTY BOROUGH OF BURNLEY.

(GAS DEPARTMENT.)

THE Gas Committee of the Burnley Corporation invite Applications for the Position of SHOWROOM MANAGER and INTERNAL FITTINGS INSPECTOR. Salary £250 per annum.
Further information as to Duties may be obtained from the undersigned, to whom Applications should be sent not later than Tuesday, the 18th of April, 1922.
JNO. P. LEATHER, Gas Engineer.
Gas-Works, Burnley, March 28, 1922.

EXPERIENCED Sales Representa- TIVE required by a progressive Company marketing First-Class Gas Appliances at Competitive Prices. Good Connection with Gas Undertaking essential.
Apply, by letter, to No. 7159, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

PLANT, &c., FOR SALE & WANTED

FIRTH BLAKELEY, SONS, & CO., Ltd., Church Fenton, Leeds, have the following Plant to offer:
BEDS of 6's and 8's 22 by 15 ☐ 6 in. Pipes. Cheap before removal. Could refix or Tender including Retorts and Settings.
GASHOLDERS—300,000, 172,000, 115,000, 50,000. 30,000, 20,000, and Two 5000 capacity.
"HOLMES" & "KIRKHAM" WASHER-SCRUBBERS, 10 in., 12 in., and 14 in. Connections.
"LIVESEY" WASHERS, 12 in. & 8 in. Connections.
CONDENSERS. Annular Set of 8 with 20 in. Connections, new inner tubes, ready for delivery. Water Tube Condenser 20,000 per hour, 15 in. Connections.
CONDENSERS. Sets of 4 Annular, 8 in. & 12 in, Connections. Sets of 6 in. & 9 in. Vertical Pipe.
EXHAUSTERS and ENGINES. Waller's & Donkin's from 50,000 to 2000 capacity per hour, Steam, Gas, and Belt driven, overhauled.
TOWER SCRUBBERS, 5 ft. by 40 ft., 4 ft. 6 in., by 36 ft., 4 ft. by 20 ft., 3 ft. by 13 ft.
PURIFIERS. Sets of 6 ft., 8 ft., 12 ft., and 25 ft. square, delivered and erected.
STATION METERS and GOVERNORS. 40,000 to 2000 per hour, complete.
Every Requisite for Gas-Works supplied. We undertake Delivery and Erection Complete and solicit inquiries.
DISMANTLING SPECIALISTS. Surplus and obsolete Plant purchased. Best prices paid. Removal by expert staff.
FIRTH BLAKELEY, SONS, & Co., LTD., CHURCH FENTON, *via* LEEDS

G. R.

BY DIRECTION OF THE DISPOSAL BOARD.

IMPORTANT Sale by Auction of the NEARLY NEW GAS PLANT.
At H.M. AIR STATION, KINGSNORTH, near Rochester, Kent, on Thursday and Friday, April 27 and 28, commencing at 11.30 a.m. each day. Comprising:—
NEARLY NEW TWO-UNIT HYDROGEN GENERATING PLANT, by Dempster, consisting of TWO HYDROGEN BENCHES, TWO W.G GENERATORS, Scrubbers, Pre-Heaters, Exhausters, Control Governors, Lift and Operating Floor, 2 SINGLE LIFT GASHOLDERS (20,000 to 30,000 c.ft. capacity), 12 CAST-IRON PURIFIERS, 12 ft. by 12 ft. by 5 ft., 66 MILD STEEL HYDROGEN STORAGE TANKS, 18 ft. 6 in. by 4 ft., approximately 6½ tons each, by Danks, Six THREE-STAGE HYDROGEN COMPRESSORS, Complete Equipment of Charging Station.
May be viewed six days prior to the sale on production of catalogue.
Catalogues may be obtained of the Auctioneers, Messrs.

GEERING & COLYER,

BANK CHAMBERS, ASHFORD, KENT; RYE, SUSSEX; HAWKHURST, KENT; and 2, KING STREET, ST. JAMES'S, S.W. 1. Telephones: Ashford 25; Gerrard 3801.

THE Tunbridge Wells Gas Company have for Disposal:
One Steel Lattice-Framed, Two-Lift GASHOLDER, 80,000 c.ft. capacity.
Also, One 10-in. "Parkinson" Water-Loading STATION GOVERNOR, complete with Valves, Bye-Pass, and New Spare Bell.
Also, One Cylindrical STATION METER (Parkinson's) 8000 c.ft. per hour capacity, complete with Valves and Bye-Pass.
The whole of this plant is in condition equal to new, and can be viewed at any time.
Apply to the ENGINEER, GAS-WORKS, TUNBRIDGE WELLS.

FOR SALE—Gas-Works in Cheshire, owned by the Tattenhall Gas Light and Coke Company, Ltd. Annual Sale of Gas, 1 Million. Population supplied, 1000.
Further particulars may be obtained from the SECRETARY, TATTENHALL, near CHESTER.

RAILWAY Tank Wagons for Dis- posal, Rectangular and Cylindrical, specially suitable for Oil, Inflammable Liquids, also Acids.
Inquiries invited.
BROTHERTON & Co., LTD., LEEDS.

FOR Sale, cheap, Two Horizontal STEAM ENGINES, Cyl. 12 in. by 22 in. Stroke, Automatic Expansion Valve Gear, by Benson, Nottingham. Must be sold—a bargain.
STEEL, Engineer, CORDEN WORKS, NOTTINGHAM.

STEAM-BOILERS—All Sizes, Vertical, Loco-type, Cornish, Portable, and Other Types of Boilers.
Apply GRANTHAM BOILER & CRANE CO., LTD., GRANTHAM.

WANTED—About a dozen "Hella" BUSHLIGHT MANTLES, as sold about 12 to 15 years ago. May be slightly damaged.
53, RUSKIN WALK, HERNE HILL, S.E. 24.

WANTED—A Second-Hand Purify- ING BOX, about 24 ft. square. London District.
Particulars to No. 7155, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

WANTED—Old Fire Brick, &c., in and outside of London. We require Old FIRE BRICK, CONCRETE, STONE, CLINKER, &c., in Large Quantities, and Invite Inquiries from Companies who are pulling out Retorts, &c.
LEWIS MORGAN & Co., Ltd., 20, HIGH HOLBORN, W.C. 1. Phone, Holborn 915.

CONTRACTS OPEN.

ASHBORNE URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council are prepared to receive TENDERS for 12 in. and 10 in. PIPES and SPECIALS. Particulars and quantities from the undersigned.
Tenders, sealed and endorsed "Mains," addressed to the Chairman of the Gas Committee, to be Delivered to the undersigned not later than the 22nd inst.
The Council do not bind themselves to accept the lowest or any Tender.
By Order of the Gas Committee, H. G. HARRISON, Manager.
Gas-Works, Ashborne, April 8, 1922.

COCKERMOUTH URBAN DISTRICT COUNCIL.

TENDERS required for two Purifiers, 20 ft. by 10 ft.; also CONDENSERS, 250,000 c.ft. per diem.
Particulars from, A. F. YOUNG, Secretary and Manager.

COMPANY NOTICES.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the Cannon Street Hotel, Cannon Street, London, E.C., on Tuesday, the 2nd of May, 1922, at 2.30 p.m. precisely, when a Report will be made to the Proprietors; a Final Dividend declared for the year ended 31st December, 1921; and the usual Ordinary Business of such Meeting transacted.
The CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 18th inst. until the 2nd of May, both days inclusive.
By order of the Board, ROBERT W. WILSON, Secretary.
Offices, 6, London Wall, London, E.C. 2, April 10, 1922.

NOTE NOTE

NEW ADDRESS

TELEPHOS LTD.,
VAUGHAN ROAD,
HARROW, N.W.

Telephone: HARROW 777. Telegrams: "PILOTLESS, HARROW."

TELEPHOS GAS SWITCH AND BROADBERRY STREET LAMP CONTROLLER.

Ask for Particulars and Prices.